CHAPTER 5 GROUND WATER QUALITY MANAGEMENT IN NEW MEXICO

5.1 SOURCES OF GROUND WATER CONTAMINATION

In the late 1970s, the NMED began evaluating existing information on vulnerable aquifers and major known and potential contamination sources. Evaluation of existing information by NMED has become an ongoing process as focus has shifted from identification of major potential sources of contamination to specific questions about known or suspected ground water problems. An initial inventory of known or suspected cases of groundwater contamination resulting from surface impoundments and other facilities was concluded in 1980 (Boyer, McQuillan and Goad 1980). An update, expansion, and computerization of this inventory of groundwater contamination incidents of all types from all sources through 2001 were concluded in 2002.

In general, groundwater contamination most frequently occurs in vulnerable aquifer areas where the water table is shallow although other factors including precipitation, soil type, and preferential flow pathways also affect vulnerability. Vulnerability maps, based on aquifer depth, were prepared in 1989 for all counties in the state. These county maps are available for inspection at the NMED Ground Water Quality Bureau office in Santa Fe. The EMNRD developed vulnerability maps for the San Juan Basin in northwestern New Mexico in 1985 and 1992, which are available for inspection at its office in Santa Fe.

As of February 2004, approximately 200 facilities that have ground water discharge permits had confirmed ground water contamination. At least 135 additional sites had either confirmed ground water contamination or presented a threat to ground water. Ground water contamination most frequently occurs in vulnerable aquifer areas where the water table is shallow.

Prevention of ground water contamination is clearly more cost effective and technically achievable than remediation. The cost of one facility inspector for one year, who may assess compliance at up to 100 facilities during that year, is equivalent to the cost of one ground water investigation, at one contaminated site of average size and complexity.

More than half of ground water contamination cases in the state have been caused by nonpoint sources, predominantly household septic tanks or cesspools. Nonpoint source contamination may be caused by diffuse sources such as large numbers of small septic tanks spread over a subdivision, residual minerals from evapotranspiration, animal feedlot operations, dairies that land-apply their effluent, areas disturbed by mineral exploration and/or storage of waste products, urban runoff, or application of agricultural chemicals. Point source categories include publicly and privately owned sewage treatment plants with flows over 2,000 gallons a day, dairy lagoons, mines, food processing operations, industrial discharges, landfills, and accidental spills or leaks.

5.1.1 NONPOINT SOURCES OF CONTAMINATION:

5.1.1.1 Household Septic Tanks and Cesspools

It is estimated that there are over 200,000 household septic tanks or cesspools in the state discharging roughly 75 million gallons per day of wastewater to the subsurface. In shallow water table areas, the effluent percolates rapidly to underlying aquifers. These systems can pollute ground water with the following contaminants:

- total dissolved solids (TDS);
- iron, manganese, and sulfides (anoxic contamination);
- nitrate;
- potentially toxic organic chemicals; and
- bacteria, viruses, and parasites (microbiological contamination).

TDS contamination occurs largely from 'mineral pickup,' the increase of minerals during domestic

use. Anoxic contamination is a chemical condition in which the water is deficient in oxygen. It can be caused by septic tank discharges or by naturally occurring geologic deposits such as humus and peat. Iron, manganese and hydrogen sulfide, typical anoxic contaminants, can cause severe taste and odor problems and can stain laundry and porcelain, but are not known to be hazardous to human health. Nitrate contamination, on the other hand, typically lacks such aesthetic problems, but can cause methemoglobinemia, a rare but potentially serious and sometimes fatal disease affecting infants. Questions have also been raised as to whether nitrates can cause cancer in healthy adults who have been exposed to high nitrate over a lifetime. Ground water nitrate levels resulting from household septic tank contamination have been monitored at concentrations as high as 30 milligrams per liter as nitrogen (30 mg/L as N), three times the health standard.

Household septic tanks and cesspools constitute the single largest known source of ground water contamination in the state. Widespread nitrate contamination and/or anoxic conditions have been documented in Chamita, Española, Pojoaque, Tesuque, Santa Fe, Bernalillo, Corrales, Albuquerque and its South Valley, Carnuel, Bosque Farms, Los Lunas, Belen, Carlsbad, Nara Visa, Lovington, and Hobbs.

5.1.1.2 Agriculture

Evapotranspiration (ET) is a process in which water enters the atmosphere either by direct evaporation or by transpiration from living plants. Minerals left behind in the soil following ET water losses can increase the TDS of shallow ground water and form alkali deposits. In the Rio Grande Valley, for example, irrigation canals have diverted river water for hundreds of years. Percolating irrigation water has caused the shallow water table in many valley areas to rise and be more vulnerable to ET. This problem can be remedied by the construction of drains to lower the water table, as was done in Albuquerque in the 1930s. Irrigation water can also provide a pathway of cross-contamination between septic tanks or other sources of contamination and shallow drinking water supply wells.

Dairies that land-apply their effluent can be a significant source of ground water contamination by nitrate, chloride, and TDS. Nitrate levels up to 180 mg/L as N have been reported as a result of land application of dairy effluent.

Another concern with agriculture is the application of agricultural chemicals. NMED and the U.S Geological Survey have conducted various sampling projects for pesticides in ground water. Trace concentrations (low µg/l or less) of arsenal, atrazine, bromacil, carbaryl, carbofuran, dacthal, disulfoton, DDE, DDT, heptachlor, lindane, metolachlor, napropamide, prometon, and propazine have been detected in ground water at various locations in the state. Carbon tetrachloride, a former grain fumigant, has been detected at levels up to 500 µg/l. Additionally, agricultural fertilizers have contaminated ground water with nitrate at several locations.

5.1.2 Point Sources of Contamination:

5.1.2.1 Oil Field Sources

The most common cause of oil field contamination is the past practice of disposal of produced water to unlined pits. Other causes include leaks of crude petroleum and/or produced water from pipelines and well casings.

Produced waters, often brines, tend to gravitate to the lowest part of a freshwater aquifer and migrate along a hydraulic gradient different from that of the water. In addition to inorganic contaminants, such as chloride, most produced waters contain aromatic hydrocarbons that also can contaminate ground water. At the present time, ninety-eight percent of the approximately 550 million barrels of water produced annually in the state is injected into deep wells for the purposes of secondary recovery, pressure maintenance or disposal.

Crude oil and natural gas condensate, if discharged in the liquid phase by upsets or spills, will float atop the water table and their water soluble constituents will dissolve into the ground water.

Previous OCD surveys of reported spills found that nearly half were due to corrosion of tanks,

valves, or pipelines. An "Aging Infrastructure" workgroup was created to investigate contamination as a result of releases and identify solutions. Oil field contamination of ground waters has been a more serious problem in southeastern production areas of the state than in those in the northwest part of New Mexico. This is due to the larger quantity and generally poorer quality of water produced in the southeast, as well as the relative vulnerability of southeastern sole-source aquifers (e.g. the Ogallala). Cases of documented ground water contamination as a result of oil and gas exploration and production, however, are increasing in northwestern New Mexico. A priority OCD study of unlined pits in northwestern New Mexico funded by U.S Environmental Protection Agency (EPA) under a Clean Water Act (CWA) grant documented ground water contamination resulting from produced water disposal to unlined pits (Olson 1989).

5.1.2.1.1 Oil Conservation Division Ground Water Quality Studies

The Cedar Hill/Animas Valley Gas Study investigated the source of natural gas in ground water and domestic water wells in the area along the Animas River north of Aztec in San Juan County, and extending to Bondad, Colorado. The study identified natural sources and some oil and gas production wells as conduits for migration of natural gas. Wells found to be acting as conduits are required to have remedial cementing or to be plugged. In addition, OCD has instituted new cementing requirements for oil and gas wells in the San Juan Basin.

In 2003 a study was conducted to identify and perform corrective action on potential sources of contamination from old abandoned and plugged oil and gas wells within the Carlsbad municipal well field. The study identified two 1950's vintage drill holes that required replugging by the Division. Similar studies in all municipal well fields are planned in the future beginning with Lovington in 2004. In addition, a water resources study of the Chihuahuan Desert area will be conducted in 2004. The study will determine the quality and extent of the fresh water in an area of New Mexico that is subject to exploration for oil and gas.

5.1.2.1.2 Refined Petroleum Product Sources

The most common cause of petroleum product contamination in the state is leaking underground storage tanks (LUSTs). Causes of leaks include spills, overfill, and faulty installations, as well as tank and line corrosion. Line damage is the most common cause of leaks. In addition to ground water contamination, LUSTs can cause explosive hazards when product vapors migrate to basements and utility corridors. All tank systems had to comply with strict new performance standards by December 22, 1998. At the beginning of the ten-year period preceding the 1998 deadline, it was estimated that 30 to 50 percent of tank systems had leaked. Since substandard tank systems were replaced, upgraded or removed, it is estimated that less than 5 percent of the approximately 4,051 underground storage tanks in the state are leaking.

Other sources of refined petroleum product contamination include leaks and tank-bottom water discharges from aboveground storage tanks, leaks and hydrostatic test water discharges from pipelines, transportation accidents, and waste oil disposal.

5.1.2.2 Nitrate Sources

Point sources of nitrate contamination include sewage treatment plants, commercial septic tank leachfields, food processing facilities, dairy lagoons, slaughterhouses, fertilizers, mining facilities, explosives manufacturing and disposal sites, and other industrial facilities. Nitrate contamination, such as from mining, can result in considerably higher concentrations (e.g. 500 mg/L as N) than those resulting from domestic wastewater, which seldom exceed 30 mg/L as N (the health standard is 10 mg/L). Dairy lagoons, which are common in New Mexico, can cause nitrate contamination up to 280 mg/L as N.

NMED reviews discharge plans reviewed for domestic wastewater disposal systems. Systems subject to discharge plan requirements include both private domestic wastewater systems discharging over 2,000 gallons a day, such as those serving trailer parks and resort developments, and public systems such as municipal sewage disposal systems which do not discharge to "waters of the United States" (40 CFR § 122.2).

The number of dairies in New Mexico has rapidly increased and the number of new dairies seeking

discharge permits comprises nearly half of the new permit applications received during the year. As of the end of 2003, there were approximately 234 dairies that either discharged wastewater under ground water discharge permits or applied for such permits. Ground water contamination identified at dairy operations is generally characterized as nitrate, chloride, and\or TDS concentrations that exceed the WQCC ground water standards.

5.1.2.3 Solvents Sources

Halogenated or aromatic solvents are used by many different industries such as machine shops and electronics firms, and also occur in a variety of household products. The most common solvents being detected in the state's ground water are benzenes and chlorinated methanes, ethanes, ethylenes, and propanes.

5.1.2.4 Metals/Minerals Sources

Extraction of a variety of minerals is an important activity in New Mexico, with copper, molybdenum and uranium receiving major permitting attention in past years. At present, all former uranium mills are closed or undergoing reclamation and remediation. Copper and molybdenum mining operations continue to operate in New Mexico. Mining ground water discharge permitting is expected to be a priority for the next few years and NMED is in the process of modifying several mining permits to incorporate comprehensive abatement plans to address existing ground water contamination and closure plans which will protect ground water quality after mining operations cease.

Contamination by metals and/or minerals may be caused by mining and milling or other ore processing activity. Common contaminants include sulfate, pH, nitrate, total dissolved solids, heavy metals, radionuclides, and other trace elements.

Ore refining mills produce large quantities of tailings that typically contain elevated levels of metals/minerals. Due to engineering convenience and economic advantages, tailing impoundments have often been located in alluvial valleys close to the mill. This frequently causes ground water contamination, which persists long after removal or amelioration of the sources of contamination.

5.1.2.5 Public Landfills

Concern about the potential for landfills to contaminate ground water has grown in recent years. Very little is known about the composition of wastes buried in landfills in the state. Constituents known to occur in landfill leachate include chlorides, nitrogen species, solvents, and a large number of other organic contaminants.

Household wastes alone contain a large number of leachable constituents. In an Albuquerque survey of household hazardous waste, more than 50% of the wastes identified were disposed of in area landfills, including more than 53,000 gallons of used motor oil per year (Salas, Gordon, and Anglada 1983).

Large quantities of septage (solids and liquids pumped from septic tanks periodically) have in the past been discharged to unlined pits at several landfills in the state, a practice no longer allowed. The septage in several cases has been commingled with industrial wastes such as produced water, waste petroleum products and chlorinated solvents.

NMED has conducted a limited study of ground water quality impacts of landfills in the state. Ground water contamination has been documented at eight landfills (McQuillan and Longmire 1986, Baker and McQuillan 1988). The BLM is conducting studies at several of its landfills, particularly in Doña Ana and San Juan Counties.

Implementation of the 1990 Solid Waste act has resulted in the closure or permitting of most of the landfills in the state. Currently about 90% of the solid waste generated is disposed in lined and permitted landfills. Illegal, abandoned, or unlined landfills may continue to affect groundwater, but due to the cost of locating and monitoring these sites, the effect has not been quantified.

5.1.2.6 Septage Disposal

Vacuum truck operators provide a vital service to septic tank owners by periodically removing accumulated solids. In some areas of the state, however, operators do not dispose of septage using legally or

environmentally sound mechanisms. Several septage disposal sites have been found to contain petroleum products, metals, minerals, and solvents. To help correct the situation, NMED has developed a database of septage hauler businesses and facilities that are permitted to receive septage for disposal in New Mexico. Additionally, guidelines for septage disposal are also under development. NMED is also working with local governments and private operators to permit environmentally sound and legal septage disposal facilities around the state.

5.2 PROGRAMS FOR GROUND WATER POLLUTION CONTROL

New Mexico relies on several programs to protect and maintain ground water quality. These include programs established under the New Mexico Water Quality Act (§ 74-6-1 et seq., NMSA 1978), the major statute dealing with water quality management at the state level, as well as other programs and actions taken under other state law and regulations that have components related to ground water pollution (see Appendix E). In addition, the state cooperates with the federal government on various ground water pollution control programs derived from federal mandates. Counties and municipalities also have broad authorities relevant to ground water pollution control. Important aspects of both state and federal programs and of local authorities are described below.

5.2.1 STATE REGULATION OF GROUND WATER QUALITY

New Mexico's ground water protection program was well established before most federal legislation addressing ground water quality was adopted. In 1967, the state's first water quality protection law, the Water Quality Act, was adopted by the New Mexico legislature. This law was amended in 1973 to allow the state to adopt regulations requiring permits for water quality protection. By 1977 the state had adopted a comprehensive ground water quality program applicable to most types of discharges in the form of regulations promulgated by the New Mexico Water Quality Control Commission (WQCC). These regulations have been modified and updated over the years, but the framework for water quality protection in New Mexico has remained essentially the same since 1977. Key features of the 1977 water quality protection rules include a requirement for dischargers to obtain a Ground Water Discharge Permit to prevent ground water contamination from discharges that have the potential to impact ground water quality, requirements for reporting and addressing spills and releases, and numerical standards for common ground water contaminants. The rules and standards protect all ground water in New Mexico that has a total dissolved solids concentration of 10,000 mg/l or less. These rules have been updated through the years to include additional ground water quality standards, ground water pollution assessment and abatement regulations, and underground injection control (UIC) requirements. Programs established under the New Mexico Oil and Gas Act, Hazardous Waste Act, Ground Water Protection Act, Solid Waste Act, Emergency Management Act, Voluntary Remediation Act, and Environmental Improvement Act also contain provisions which are designed to protect ground water quality and which implement the WQCC ground water quality standards by reference.

5.2.1.1 Water Quality Act and Water Quality Control Commission Regulations

Under the authority of the Water Quality Act, the New Mexico Water Quality Control Commission (WQCC) has promulgated regulations, 20.6.2 NMAC, to protect the state's ground waters, including the broadly applicable ground water protection regulations of 20.6.2.3000 NMAC et seq., the more detailed additional requirements of 20.6.2.5000 NMAC et seq. for underground injection control, and the spill response and abatement regulations found in 20.6.2.1203 et seq. and 20.6.2.4000 NMAC et seq. These regulations are commonly referred to as the WQCC Regulations and are described in more detail below (WQCC 2002).

5.2.1.1.1 20.6.2.1203 NMAC - Notification of Discharge/Removal

WQCC Regulation 20.6.2.1203 NMAC imposes notification and corrective action requirements on any unpermitted discharger of any water contaminant. The majority of discharges currently handled under

this regulation are spills of petroleum products, sewage, and industrial chemicals. Application and enforcement of these regulations are coordinated with other regulatory requirements that are source or industry specific, through language in 20.6.2 NMAC listing those regulatory programs that are equivalent to this section. This coordination ensures that facilities have to comply with one only on set of regulations.

Relatively minor discharges are handled under a Corrective Action Report, pursuant to 20.6.2.1203 NMAC, and are closed out in a short period of time, usually under 180 days. For cases that cannot be cleaned up to standards in 180 days, NMED and OCD may require the submission of an abatement plan pursuant to 20.6.2.4000 NMAC.

5.2.1.1.2 20.6.2.3000 NMAC – Permitting and Ground Water Standards

20.6.2.3000 NMAC includes the state's ground water quality standards and ground water discharge permit/pollution prevention requirements. These regulations are designed to protect, for uses designated in the New Mexico Water Quality Standards for Interstate and Intrastate Streams, all ground waters with total dissolved solids concentrations of 10,000 mg/L or less for present and potential future use as domestic and agricultural water supply, and those segments of surface waters that are gaining because of ground water inflow (WQCC 2002, WQCC 1995). As of 2003, 48 numeric ground water quality standards had been adopted by the Water Quality Control Commission. Additionally, 52 organic compounds or classes of organic compounds are listed as toxic pollutants which cannot exceed concentrations in ground water that will unreasonably threaten to injure human health, or the health of beneficial animals or plants.

The cornerstone of the state's pollution prevention efforts are the ground water discharge permit regulations. These regulations require that a person discharging onto or below the surface of the ground demonstrate he will not cause ground water standards to be exceeded in ground water at any place of withdrawal for present or foreseeable future use, and will not cause any stream standard to be violated. Ground water discharge permits include operational requirements for the facility, ground water and effluent monitoring programs, and contingency and closure plans. The regulations also provide authority to require financial assurance for proper closure of the facility. Since their adoption, these regulations have been a relatively effective tool in preventing ground water contamination.

NMED is delegated responsibility by the WQCC for enforcement of the state ground water protection regulations as they apply to industrial facilities (including mining), domestic waste treatment and disposal systems, municipal discharges, food-processing facilities, and agricultural discharges. By the end of 2003, NMED had received and processed over 1,464 discharge plans (Figure 5-1).

OCD is delegated responsibility by the WQCC for enforcement of the state ground water protection regulations as they apply to oil refineries, natural gas processing plants and compressor stations, carbon dioxide facilities, geothermal installations, natural gas transmission lines, brine production wells, and oil field service companies. Through December 2003, OCD was responsible for approximately 355 discharge permits. The discharge permit requirement can be described as a discharge plan prepared by the discharger which the NMED or OCD approves, approves with conditions, or disapproves. Discharges that are covered by these regulations include discharges to surface impoundments and leach fields, application of wastes to land, and injection or infiltration of contaminants into the subsurface. Among discharges specifically exempted are those related to coal surface mining that are regulated under the New Mexico Coal Surface Mining Act (§§ 69-25A-1 et seq., NMSA 1978), discharges from oil and natural gas exploration and production activities which are regulated under the New Mexico Oil and Gas Act (§§ 70-2-1 et seq., NMSA 1978) and individual domestic septic tank discharges of less than 2,000 gallons a day, that are regulated under the state's liquid waste disposal regulations and/or under local ordinances. Water used in irrigated agriculture is also exempted unless the irrigation water is effluent from a system for treating or disposing of sewage, industrial wastes, or other wastes that will pollute any waters of the state.

Discharge permits usually are approved for a period of five years. Because the regulations became effective in 1977, many discharge plans have been in effect for more than five years. As a result, an increas-

ing portion of the discharge permit review process is for renewal or modification of existing discharge plans. The number of new requests for discharge permits also continues to increase. New permit requests include domestic wastewater treatment and disposal facilities, dairies, and new industrial dischargers.

Fees collected from facilities seeking a ground water discharge permit help fund NMED and OCD discharge permit programs. Fees pay for approximately 10% of the cost of issuing, modifying, and renewing permits, and periodic monitoring of permitted facilities. The WQCC approved a fee increase in 2001 to better address permit issuance costs.

Implementation of the ground water discharge permit program also involves the compliance inspection of permitted facilities, as well as the review and evaluation of self-monitoring reports and enforcement. Compliance inspections generally are scheduled annually, and often include split-sampling of monitor wells with the permittee. Most facilities are required to sample monitor wells on a quarterly basis, and a once-a-year split-sample is considered adequate to assure the accuracy of the self-monitoring data. For NMED's regulated facilities, basic information including date of receipt, whether the data was complete and whether there was an exceedance of the ground water standards, is entered into a computerized database. All NMED programs have direct access to this database.

5.2.1.1.3 20.6.2.5000 NMAC – Underground Injection Control

The State of New Mexico has primary enforcement authority for the underground injection control program established by the federal Safe Drinking Water Act (SDWA). Primacy was obtained in 1982 for injection wells used in drilling for and production of oil and natural gas, known as Class II wells in the EPA's classification system, and for all other classes of wells in 1983. Primacy makes a state eligible for an annual federal grant under the SDWA. In New Mexico, primacy also avoids the necessity of having EPA run a federal underground injection control program in the state in duplication of the long-established state ground water discharge permit program.

New Mexico's underground injection control program is carried out partly under the authority of the New Mexico Oil and Gas Act and partly under the authority of WQCC Regulations, 20.6.2 NMAC, promulgated pursuant to the New Mexico Water Quality Act. OCD is the lead state agency for the under ground injection control program because the majority of injection wells in the state are associated with oil and natural gas production. Regulation of these wells is described below under Oil and Gas Act.

The WQCC regulations apply to underground injection wells other than those associated with oil and natural gas production. NMED administers this program except for OCD-administered brine production wells and those wells disposing of effluent from refineries, geothermal operations, and the oil field service industry. All types of injection wells subject to WQCC regulations must comply with general ground water protection provisions of 20.6.2.3000-3999 NMAC. Injection wells used for effluent disposal and *in-situ* mineral extraction must also meet the technical requirements imposed by 20.6.2.5000-5999 NMAC, which were adopted in 1982. The underground injection control portions of the WQCC regulations were modified in 2001 for better alignment with federal regulations, especially with regard to nomenclature and definitions.

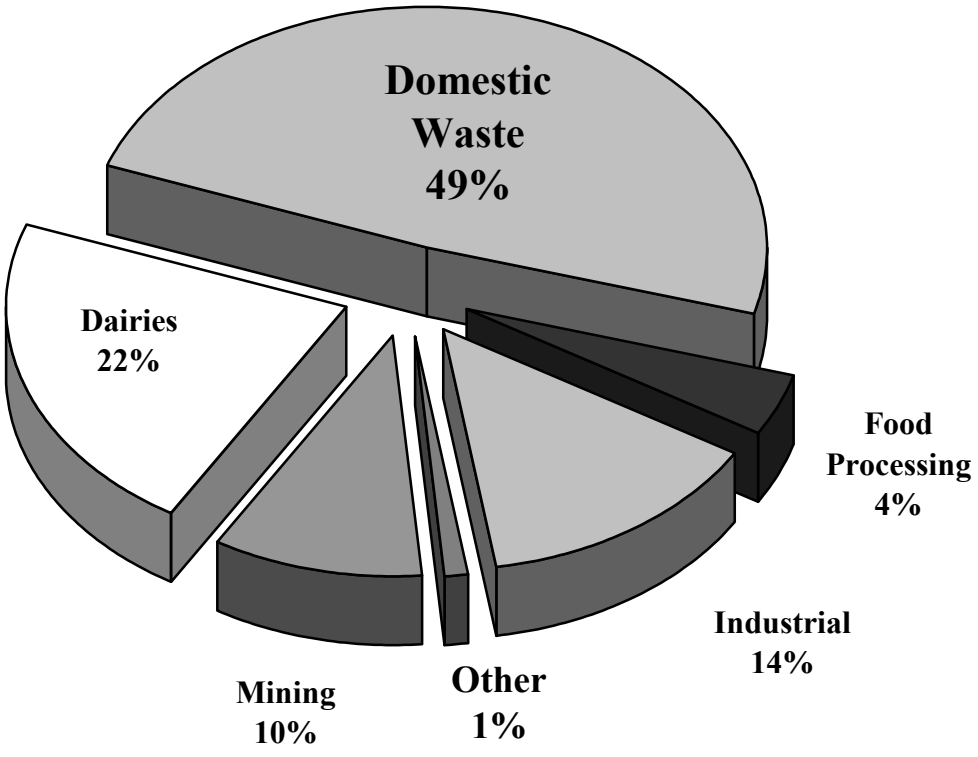
An inventory of operating underground injection wells in New Mexico as of the end of 2000 shows the following:

- **Class I** includes the emplacement of hazardous and nonhazardous fluids (industrial and municipal wastes) into isolated formations beneath the lowermost underground source of drinking water. Because they may inject hazardous waste, Class I wells have the most stringent federal requirements. In New Mexico, there are no permitted Class I hazardous waste injection wells. There are five permitted Class I Non-Hazardous waste injection wells that dispose of wastewater at chemical and petroleum refinery facilities.
- **Class II** includes injection of brines and other fluids associated with oil and gas production. In New Mexico, there are approximately 4,763 Class II wells that are regulated solely by OCD.
- **Class III** encompasses injection of fluids associated with solution mining of minerals. In New Mex-

ico, there are 123 wells at 19 uranium and brine production facilities.

- **Class IV** addresses injection of hazardous or radioactive wastes into or above a drinking water aquifer. In New Mexico, there are no permitted Class IV wells.
- **Class V** includes all underground injection not included in Classes I-IV. Class V wells inject non-hazardous fluids into or above a drinking water aquifer and are typically shallow, on-site disposal systems, such as floor and sink drains which discharge domestic or commercial sewage directly or indirectly to ground water through vertical wells or leachfields. In New Mexico, there are approximately 1,885 Class V wells that are permitted by NMED. This class comprises the majority of permits issued by our UIC program, primarily: large capacity septic tank/leachfield systems, sewage treatment plant/leachfield systems, ground water remediation injection wells used to inject contaminated ground water that has been treated to ground water quality standards, and stopes leaching wells for the solution mining of conventional mines.

FIGURE 5-1: ALL DISCHARGE PERMITS WITH MONITORING REQUIREMENTS



5.2.1.2 Enforcement of Water Quality Control Commission Regulations

Enforcement of WQCC regulations for ground water pollution control is pursued as limited resources allow. Major enforcement efforts are aimed at assuring that intentional discharges of sewage, industrial and mining effluents, dairy wastewater, and other effluents are in conformance with discharge permit requirements, which in turn should assure that ground water will not be degraded beyond standards. Other major enforcement efforts are aimed at requiring responsible parties to address pollution caused by leaks, spills, or other discharges not made in conformance with regulations.

In general, three methods for achieving compliance with regulations are used by the state. These in-

clude attempts to obtain voluntary compliance, including notices of noncompliance and settlement agreements; issuance of Notices of Violation and Compliance Orders; and civil lawsuits filed in state district court under the Water Quality Act or applicable portions of the Public Nuisance Statute (c.f., §§ 30-8-3, 30-8-12, NMSA 1978) or both (including negotiated settlement agreements filed with the court pursuant to those suits).

The Water Quality Act was amended in 1993 to provide constituent agencies of the WQCC with the authority to issue Compliance Orders that can include administrative penalties (§ 74-6-10. A. and C., NMSA 1978). Compliance Order authority provides both a deterrent to future illegal activities as well as providing a more rapid enforcement capability when voluntary compliance cannot be achieved.

5.2.1.3 Effectiveness

NMED has been working to improve the effectiveness of the ground water discharge permit program. For example: written policies and guidelines have improved consistency in the requirements imposed on different facilities and in communicating to the regulated community minimum standards for permit approval and the state's ground water pollution prevention program has adopted a team approach to issuing permits which should streamline the process and provide consistency. Additionally, the program has been collecting industry-specific information on unpermitted facilities in order to systematically require these facilities to obtain permits.

The program has also been working with older permitted facilities to bring them into compliance with current standards, policies, and guidelines. Contingency plans that delineate corrective actions for operational failures or violations of ground water standards are required for all new permits and at renewal for existing permits plans. Corrective action may include source control measures and/or ground water remediation. Closure plans are also being required for new permits and for modifications and renewals of older permits. Financial assurance for closure and contingency plans has also been required for some facilities.

Historically, facilities often made great efforts to avoid the permitting process. During the past several years, however, the state has established a proactive and cooperative working relationship with industry groups, and many facilities now view the permitting process as a routine part of their business startup and day-to-day operations. Furthermore, many lending institutions are working closely with the state to ensure that the facilities have obtained necessary permits before business loans are approved or renewed. There are many positive indications that the program is effective at protecting the quality of New Mexico's ground water resources.

5.2.1.4 New Mexico Oil and Gas Act

In addition to the WQCC regulations, OCD administers several water protection programs under the Oil and Gas Act. The Act authorizes OCD to "regulate the disposition of water produced or used in connection with the drilling for or producing of oil and gas, or both, and to direct surface or subsurface disposal of such water in a manner that will afford reasonable protection against contamination of fresh water supplies designated by the State Engineer" (§ 70-2-12.B (15), NMSA 1978). The designation by the State Engineer generally protects all streams and surface waters and all ground water having 10,000 mg/L or less total dissolved solids, except for those ground waters having no present or reasonably foreseeable beneficial use.

The OCD requires that permits be obtained statewide for drilling, for waste oil treatment plants and for commercial and centralized surface waste disposal. Most regulated activities allow for a public hearing to be requested before permit issuance.

Statewide rules require surface disposal of oil and gas related waste (including produced water, sediment oil, and drilling fluids) to be performed in a manner which prevents contamination of fresh water. For certain geographic areas of the state, specific rules have been adopted that prohibit or limit certain disposal practices. Examples include limitations on disposal of produced water into unlined pits in southeastern New Mexico beginning in 1969, and in northwestern New Mexico beginning in 1985. In 1986, rules were adopted to require permits for commercial and centralized produced water disposal facilities in the San

Juan Basin of northwestern New Mexico. In 1988, extensive statewide rules for licensing of commercial surface waste disposal facilities were adopted.

The Oil Conservation Commission in January 1993 adopted Order R-7940C, a set of stringent rules governing the disposal of produced water from oil and gas wells. These rules expand previously defined vulnerable ground water areas, create wellhead protection areas, and prohibit the disposal of oil and gas wastes and water into unlined pits in vulnerable ground water areas in northwestern New Mexico. Order R-7940C prohibits disposal of all oil and gas wastes into unlined pits in these areas and requires existing pits to be closed in accordance with OCD regulations and guidelines. In 1993 the OCD issued Surface Impoundment Closure Guidelines that provide recommended risk-based cleanup levels and closure procedures to be used in the closing of surface impoundments and for remediation of leaks, spills and releases. An additional fresh water related problem currently receiving attention is the large number of production wells that have been shut in or temporarily abandoned. The reason for this increase is that the lower price of oil and natural gas since 1985 has led to the shutdown of marginal producing wells. However, these wells cannot be left indefinitely in this condition because natural processes cause casing deterioration that can lead to interstrata communication and possible fresh water contamination. As of the end of 2003, there were 48,312 producing oil and gas wells and 2,360 wells that were temporarily abandoned. OCD has instituted rule changes to require proper temporary plugging for wells shut in for over six months. Such plugging would be allowed for a maximum of five years without reapproval.

In 1989 amendments to the Oil and Gas Act and to the Environmental Improvement Act (§§ 74-1-1 et seq., NMSA 1978) transferred responsibility for regulating some nonhazardous wastes away from NMED (under authority of the Environmental Improvement Act) to OCD (under authority of the Oil and Gas Act). The wastes now regulated under the jurisdiction of OCD are non-domestic solid wastes resulting from the exploration, development, production, transportation, storage, treatment, or refinement of crude oil, natural gas, or geothermal energy. These wastes may be generated at production sites, gas plants, refineries, and oil field service companies. OCD is required to regulate disposal to protect public health and the environment, and is incorporating review of solid waste practices in discharge plan review and in review of surface disposal applications. In 2003, a statewide pit rule was adopted that prohibited the construction or use of unlined pits in the oil and gas industry in areas where ground or surface waters exist, establishes a permitting and review process for all pits (including drilling and reserve pits) not under other rules, prohibits locating pits in any watercourse, lakebed, sinkhole, playa or wetland and specifies time frames for closure of pits.

OCD performs ground water monitoring both to carry out responsibilities delegated to it by the Water Quality Control Commission and to ensure reasonable protection of fresh water as required by the Oil and Gas Act. OCD performs necessary monitoring as part of discharge plan review and at approved discharge plan sites. These discharge plans include the regulation of natural gas plants, natural gas compression facilities, oil refineries, geothermal installations, brine production wells, and oil field service companies. At a minimum, inspections and sampling of effluents and ground water are conducted before plan approval and again prior to plan renewal.

In addition to monitoring carried out by OCD personnel, self-monitoring is also required of dischargers under conditions specified in individual discharge plans. Finally, monitoring at selected locations is conducted in response to citizen complaints in areas of oil and gas production activity. OCD is currently developing a computerized database management system for discharge plan and water quality monitoring.

As with the discharge permit process under the Water Quality Act, the permitting process under the Oil and Gas Act is much more effective at preventing new pollution from current activities than it is at coping with historical pollution problems. The most common cause of oil field contamination is the past practice of produced water disposal in unlined pits. This has been regulated in the southeastern part of the state since 1969 and in the northwestern part since 1985, but effects of past practices still persist. Although generally effective in controlling the effects of present discharges, the effectiveness of the regulatory program

under the Oil and Gas Act could be improved in two areas: (1) upgrade temporary abandonment procedures to guard against interstrata communication at wells that are temporarily out of production; and (2) additional integrity testing and berming requirements to provide better environmental protection from leaks and spills at aging pipelines, tanks, and other equipment.

5.2.1.5 New Mexico Hazardous Waste Act

The New Mexico Hazardous Waste Act (§§ 74-4-1 et seq., NMSA 1978) authorizes the Environmental Improvement Board (Board) to adopt regulations for the management of hazardous waste underground storage tanks (USTs) and above ground tanks used to store refined petroleum products. These regulations are to be equivalent to, and under certain circumstances may be more stringent than, comparable federal regulations EPA adopted pursuant to the federal Resource Conservation and Recovery Act (RCRA). However, the Board may adopt regulations for the management of hazardous waste that are more stringent than federal regulations EPA adopted pursuant to RCRA, after notice and public hearing, if the Board determines that such federal regulations are not sufficient to protect public health and the environment. Under this authorization, hazardous waste management regulations (which currently incorporate the federal regulations by reference) storage tank regulations have been adopted. These two regulatory programs are described below. This Act also authorizes NMED to take action to protect persons from harm arising from hazardous substance emergency incidents and establishes an emergency fund to be used for cleanup of such incidents. The members of the Board and its authority are described in the Environmental Improvement Act.

5.2.1.5.1 Hazardous Waste Management Regulations

Under the New Mexico Hazardous Waste Act, the Environmental Improvement Board adopted the hazardous waste management regulations in 1983, and amended them in 2003. Since these regulations, with their subsequent amendments, are equivalent to EPA's regulations promulgated under RCRA, New Mexico retains authorization to administer those delegable sections of the federal hazardous waste management program. This program applies to those wastes meeting the specific criteria to be considered 'hazardous wastes' subject to the regulations.

The federal Hazardous and Solid Waste Amendments of 1984 (HSWA), which amended RCRA, required significant changes to be made to the New Mexico program if authorization was to be retained. New Mexico legislation enacted in 1987 and 1989 provided the authority for many similar provisions provided for under the federal HSWA. This authority allows for the adoption of the delegable rules of the federal requirements that are subsequent to HSWA. Although the state does not have complete primacy to administer HSWA, This authority allows the state to enforce its regulations at RCRA facilities. On January 2, 1996, New Mexico received Corrective Action Authorization from EPA in the Federal Register at FR 2450 (1/26/96). EPA provides oversight of all delegable authority.

NMED administers the state hazardous waste management regulations for all types of facilities, including oil refinement facilities. The regulations provide for 'cradle to grave' tracking and management of materials meeting the definition of 'hazardous waste'. Generators of hazardous waste must have an EPA identification numbers, and can dispose of their waste only at an authorized facility.

5.2.1.5.1.1 TSD Facilities

Hazardous waste treatment, storage or disposal facilities (TSDFs) are required to obtain operating permits. Because site-specific detailed permits could not be issued immediately for every TSDF already in operation, EPA created a two-part permit system. Facilities that properly notified and submitted a short form (Part A) permit application were granted 'interim status'; in effect, a temporary operating permit until a site-specific operating permit could be issued. Interim status facilities are subject to a set of category-specific regulations. An interim status facility must either close under an approved closure plan or apply for an operating or post-closure permit by submission of a 'Part B' application. All TSDFs in New Mexico have either applied for an operating or post-closure permit, or have submitted closure plans for their haz-

ardous waste units. In New Mexico, there are eighteen permitted TSDFs that either have an operating permit, a post-closure permit or a combination thereof. There are three facilities that have interim status authorization and have applied for a permit. NMED and/or EPA issued these RCRA permits. Also, in addition to permitted facilities, there are five facilities that are covered under consent or other orders requiring investigation, monitoring, or cleanup of contamination. EPA or EPA issued these orders. The majority of hazardous waste units that are permitted or have interim status authorization in New Mexico are for greater-than 90-day storage, open detonation, and open burning.

A primary intent of the hazardous waste management program is to prevent contamination of water resources by hazardous waste units. A regulated hazardous waste unit, such as a landfill, surface impoundment, waste pile, or land treatment unit that is used to treat, store, or dispose of hazardous waste is subject to ground water monitoring requirements. If ground water contamination does exist, then the permit will specify a corrective action program to halt the escape of hazardous wastes and to restore the ground water, both on-site and off-site.

5.2.1.5.1.2 Hazardous Waste Generators

An exemption from most of the hazardous waste management regulations is granted to 'conditionally exempt small-quantity generators,' (CESQG) facilities that generate less than 100 kilograms (kg) of hazardous wastes a month. There are also categories of 'small quantity generator' (SQG) for the generation of between a 100 kg and a 1,000 kg a month and 'large quantity generator' (LQG) of the generation of more than 1,000 kg a month. These categories are required to follow specified regulations but vary depending on the category. In any case, no facility is allowed to dispose of hazardous wastes on its own property unless it is permitted as a disposal facility. There is currently one authorized disposal facility in New Mexico for off-site hazardous wastes that has not been constructed to date. However, there are two storage transfer facilities within the state to serve as an accumulation point to which the generators can consign their wastes. The storage transfer facility operator, typically, as part of its' business, finds an appropriate disposal facility so that the generator does not have to deal with the disposal facility.

5.2.1.5.1.3 Household Wastes

Household wastes are currently exempt from the hazardous waste regulations, but the disposal of items such as cleaners, thinners, solvents, and pesticides poses a threat to the ground water beneath local landfills and surface waters down gradient from such landfills. The City of Albuquerque and the City of Santa Fe periodically sponsor household hazardous waste collection events. During these events, household wastes are accepted by a City contractor, packaged, and shipped to an approved disposal facility. Such projects have become more common as other municipalities have become aware of the hazards to ground water posed by even relatively small quantities of domestic waste items.

5.2.1.5.2 Hazardous Waste Program

Under the state's Hazardous Waste Program, ground water data is being collected at a number of permitted and interim status Resource Conservation and Recovery Act (RCRA) facilites including: United States Department of Energy, United States Department of Defense, United States National Aeronautics and Space Administration, and private facilities. RCRA facilities that have regulated units monitor for hazardous waste and hazardous constituent parameters under the state's RCRA Hazardous Waste Program.

These state regulations are patterned after the requirements of the federal Resource Conservation and Recovery Act, that are stringent, cumbersome and lengthy.

NMED's Hazardous Waste Bureau (HWB) in conjunction with EPA's performance measures through the Government Performance Results Act (GPRA) is tracking high priority RCRA facilities with groundwater contamination migration and human exposure concerns. Of the thirteen high priority GPRA facilities in New Mexico all but one facility meet the federal requirement for human exposure under control and eight for the groundwater contamination migration under control measures.

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5.2.1.6 New Mexico Storage Tank Regulations

Requirements to report and clean up leaks and spills from leaking storage tanks and other sources that might impact water quality have been part of the WQCC regulations for many years. In 1987, the New Mexico Hazardous Waste Act was amended to give NMED specific authority to control many more aspects of USTs. The New Mexico Underground Storage Tank Regulations were first adopted by the Environmental Improvement Board (the Board) in phases starting in 1989. By 1991, the Board had in effect regulations covering the following areas: registration of tanks, assessment of fees, new and upgraded UST systems, general operating requirements for UST systems, release detection, reporting and corrective action; closure of USTs, financial responsibility for tank owners, and certification of tank installers. In 1990 certain provisions of the regulations were found to be more stringent than the federal requirements, which is a violation of the Hazardous Waste Act. To remedy the situation, the Board adopted those federal requirements by reference. In 1997 and 1998 the UST Regulations were revised to include the implementation of risk-based decision making which enabled the UST Bureau to better focus its resources, including the Corrective Action Fund, on sites where the risk to public health and the environment are greatest, and the addition of new options that local governments can use to meet their financial responsibility requirements. On June 14, 2002, the Board expanded tank registration requirements to include ASTS, and requested that the New Mexico Administrative Code's Chapter name for the regulations be changed from "Underground Storage Tanks" to "Petroleum Storage Tanks." The name of the Bureau was changed at that time to the "Petroleum Storage Tank Bureau." On August 15, 2003, requirements approved by the Board governing tank system design, installation, operation, closure, financial responsibility, and corrective action for ASTs became effective. In spite of their name, the Petroleum Storage Tank Regulations adopted by the Board include regulation of some hazardous substance USTs as well as USTs and ASTs containing refined petroleum products and their official citation is 20.5 NMAC parts 1 through 16. Part 17, Corrective Action Fund Administration, was adopted by the Environment Department under its rulemaking authority and is described under the Ground Water Protection Act, below.

5.2.1.6.1 Pollution Prevention

In New Mexico, there are an estimated 4,252 underground storage tanks and 2,000 above ground tanks (Figure 5-2). Although storage tanks are located throughout the state, they are predominantly associated with service stations, petroleum suppliers, and government facilities, all of which tend to be located in population centers (Figures 5-3 and 5-4). These population centers in turn are concentrated near surface water and vulnerable aquifers in river valleys characterized by permeable, unconsolidated sediments and shallow water tables. Without regular monitoring, a leak can go undetected for years, thus creating severe environmental and health problems that might easily have been remedied if it had been discovered right away.

From the beginning of the storage tank program in the late 1980s, NMED has aggressively promoted and enforced implementation of leak detection and upgrading of storage tank systems to higher construction and design standards. Tank owners were given ten years to meet the stricter standards for UST systems, and inspectors had the authority to issue field citations when they encountered violations. Approximately 99% of active underground storage tanks now meet the December 22, 1998, standards for construction, operation and leak detection. NMED interprets this high rate of compliance with the 1998 pollution prevention requirements, well above the national average, as resulting in the significantly lower observed percentage of leaks (5 %) from the UST population in New Mexico since December1998. Owners of ASTs have until July 1, 2011, to meet the standards set forth in the regulations for AST systems.

FIGURE 5-2: PETROLEUM STORAGE TANK BUREAU STATISTICS, 2003.

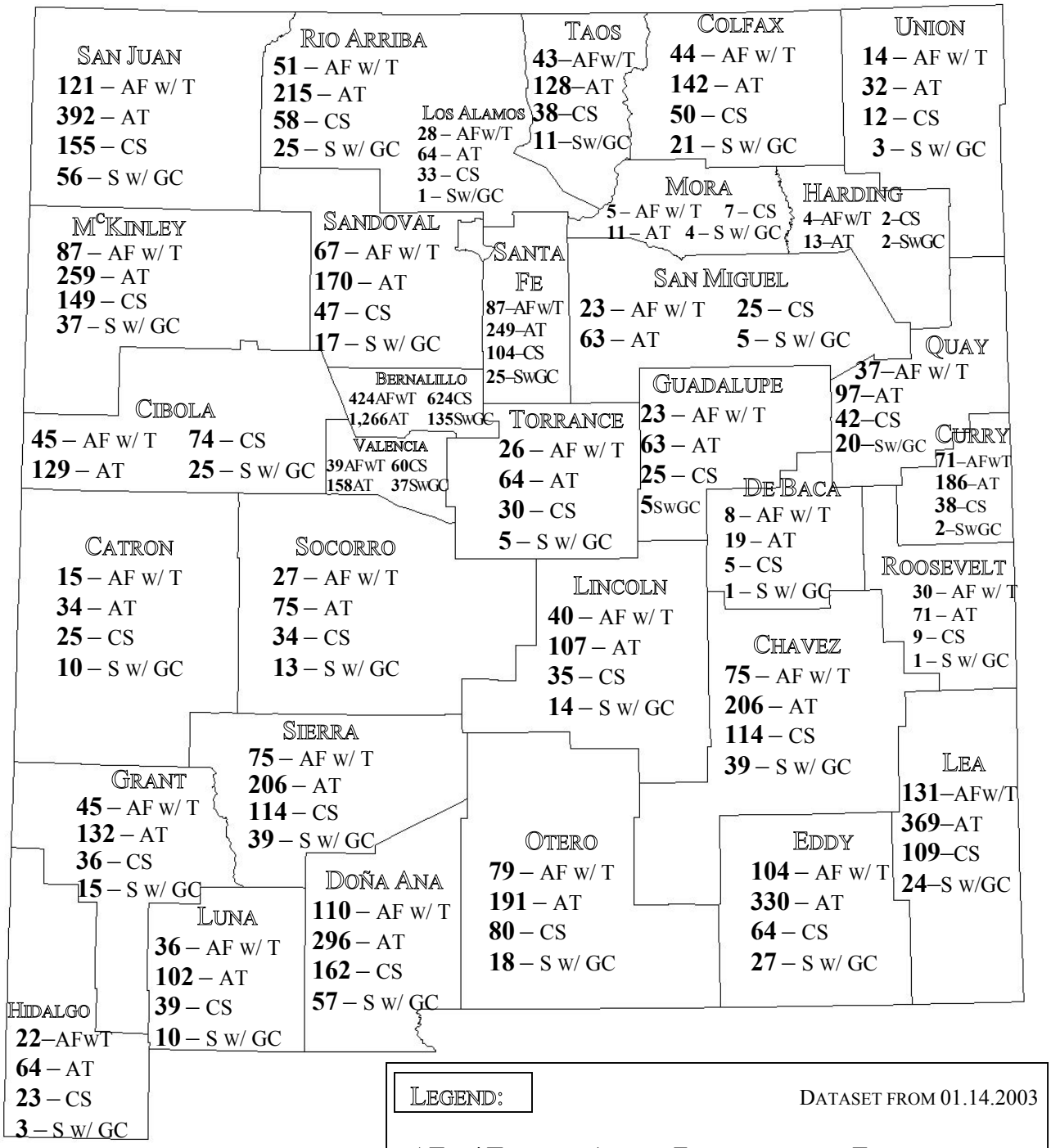


FIGURE 5-3. DENSITY OF FACILITIES WITH ACTIVE PETROLEUM STORAGE TANKS BY COUNTY.

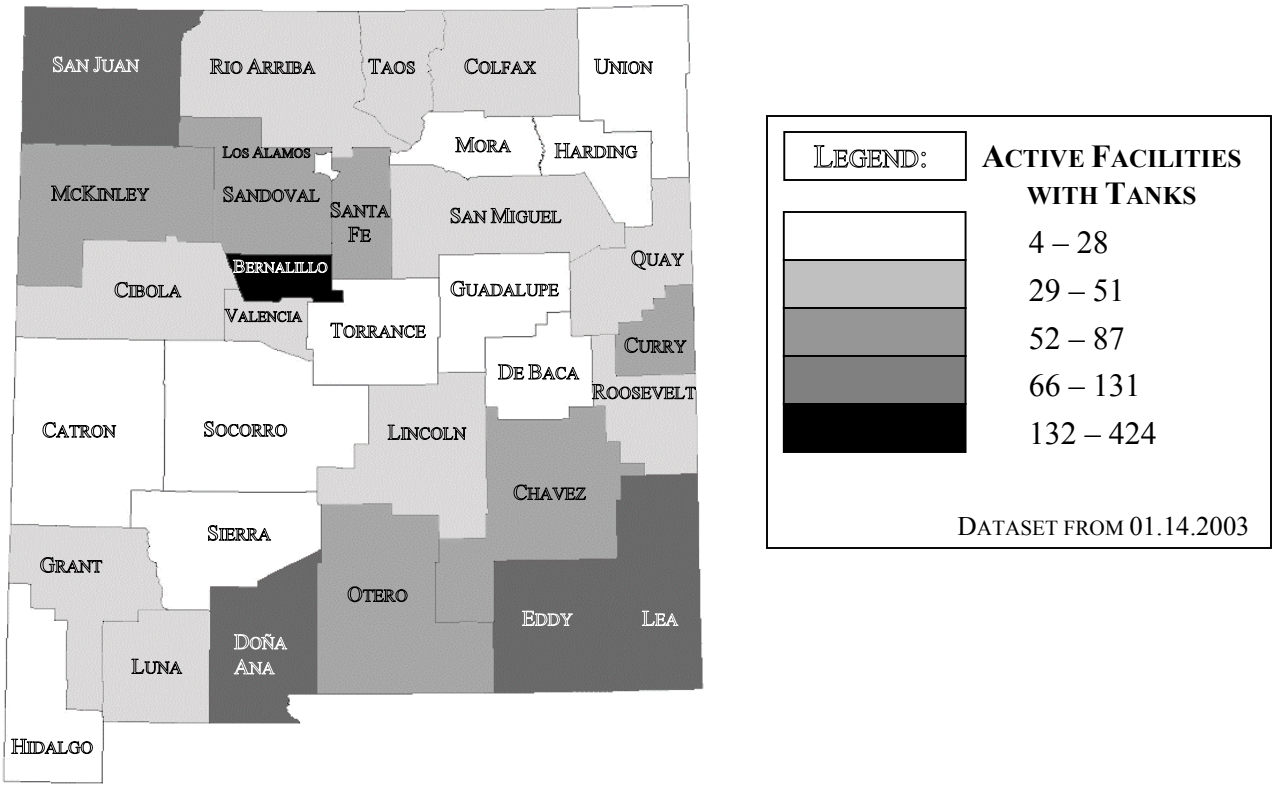


FIGURE 5-4. DENSITY OF ACTIVE PETROLEUM STORAGE TANKS BY COUNTY.

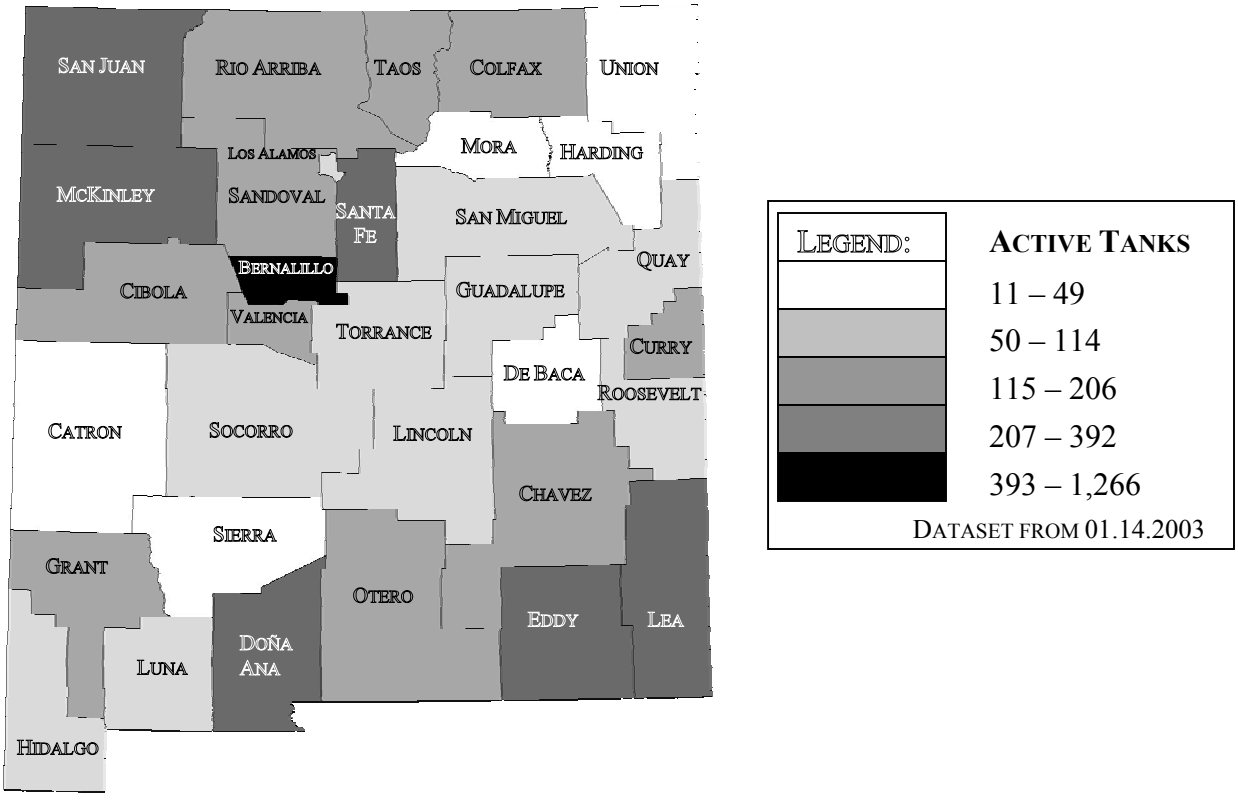


FIGURE 5-5. DENSITY OF CONTAMINATION SITES BY COUNTY.

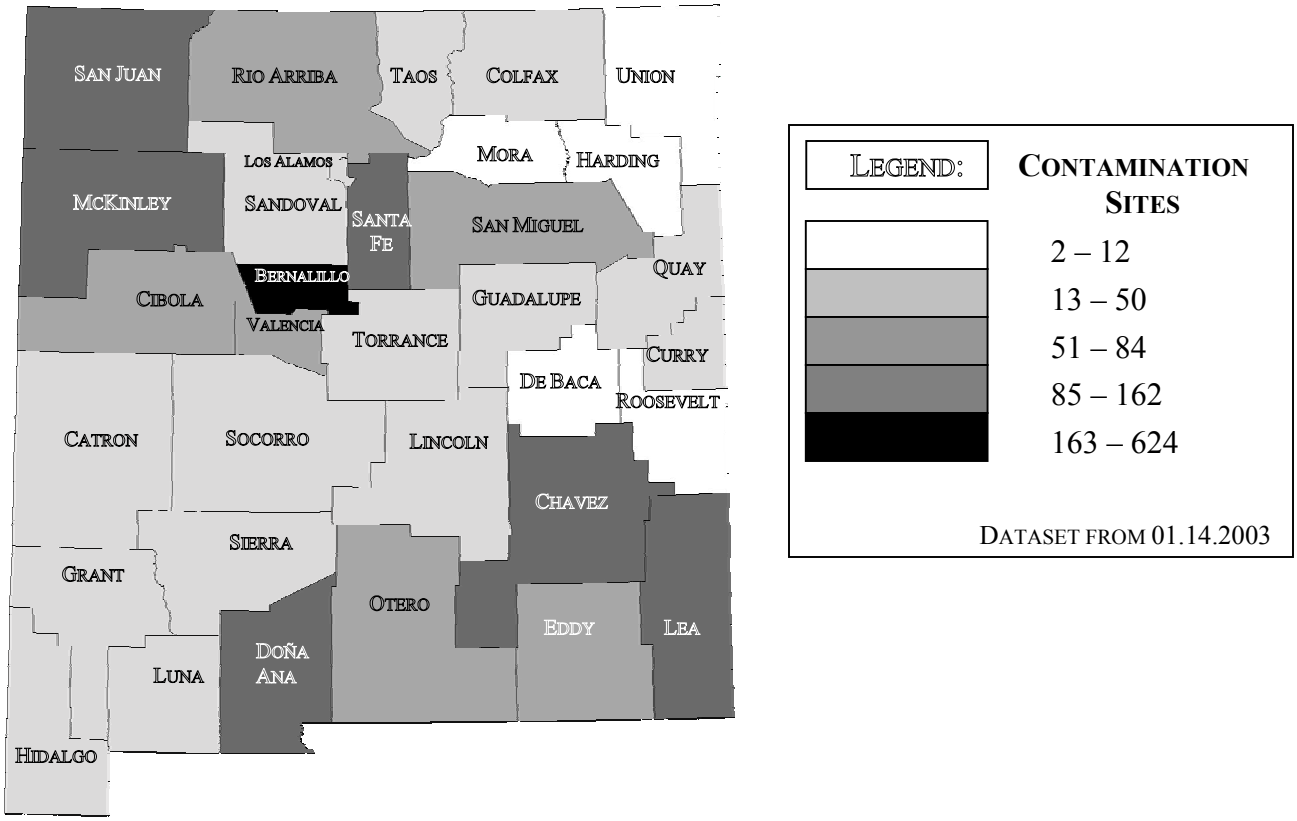
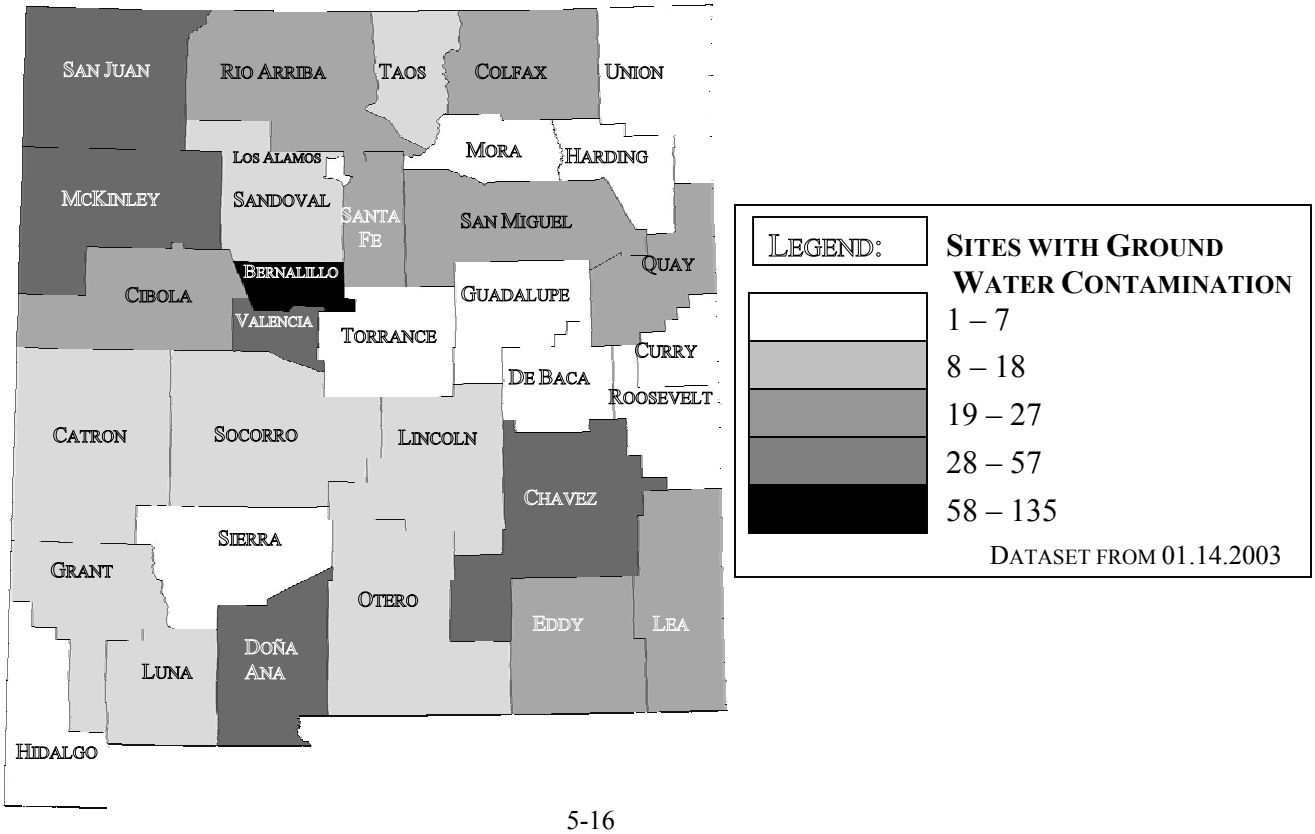


FIGURE 5-6. DENSITY OF GROUND WATER CONTAMINATION SITES BY COUNTY.



5.2.1.6.2 Corrective Action

As of September 2003, NMED had knowledge of 2,489 past and current cases of contamination, including 890 documented cases of ground water contamination resulting from leaking storage tanks, received through reports from NMED inspectors, voluntary reporting, and complaint investigations. Approximately 40 public wells, 50 private, and 155 water supply wells have been contaminated or threatened by these leaks (Figures 5-5 and 5-6).

In September 2003 the Petroleum Storage Tank Bureau was overseeing corrective action at 1,223 leak sites. Since the program began in the late 1980s, 1,226 sites have reached "No Further Action" status, including 154 sites that had ground water contamination. NMED used federal LUST trust funds to oversee corrective action at sites. In June 30, 2003, corrective action was occurring at 52 percent of leak sites that had not yet reached "No Further Action" status.

Most tank owners and operators take the corrective action required by the regulations, because they are then eligible to apply for reimbursement from the state Corrective Fund for most of their costs of corrective action. To be eligible for payments from the Fund, tank owners must complete corrective action according to pre-approved work plans, and payments may only be made when deliverables are received and accepted by the PSTB and if the tank owner is found to be in substantial compliance with statutory requirements. When tank owners are unknown, unwilling, or unable to take corrective action, PSTB may use the state Corrective Fund, through state contracts, to take the necessary corrective action. The unwilling owner may then be liable to repay the Fund for these costs. The statutory and regulatory history, features, and accomplishments of the Corrective Action Fund program are described below.

5.2.1.7 Ground Water Protection Act

The Ground Water Protection Act (§§ 74-6B-1 et seq., NMSA 1978) creates a state Corrective Action Fund to pay for corrective action at sites contaminated by the contents of leaking storage tanks. The Environment Department administers the Fund. The Act also recognizes that the owners and operators of facilities containing underground storage tanks must, under federal law, provide financial assurance and allows the Corrective Action Fund to serve that purpose. In 1991, the Ground Water Protection Act was amended to define an "owner" as owner of an underground storage tank rather than owner of a site containing an underground storage tank, and to allow for reimbursement of tank owners and operators for costs of corrective action. In 1995 the revenue stream to the Fund from the Petroleum Products Loading Fee was cut in half, and the following year amendments to the Petroleum Products Loading Fee Act outlined a fee schedule that depended on the unobligated fund balance on July 1 of each year, ranging from fifty dollars to 150 dollars per load. In 2001 the Act was amended to provide for payments to eligible owners and operators of above ground refined petroleum storage tanks for costs of corrective action.

5.2.1.7.1 Corrective Action Fund Administration Regulations

In June 1991 the Environmental Improvement Board (Board) passed Part XV, Ground Water Protection Act (GWPA) Regulations. This part established NMED priorities for corrective action at sites contaminated by releases of regulated substances from Underground Storage Tanks, defined the minimum site assessment for which an owner or operator is responsible, and set out procedures for administering the Corrective Action Fund. This fund is used for state-approved corrective action activities such as investigations, mitigation, containment, and remediation of contamination resulting from releases of regulated substances.

On September 22, 1992 NMED adopted the Corrective Action Fund Payment and Reimbursement Regulations under its rulemaking authority as directed by the 1992 amendments to the GWPA. These regulations established a program and procedures to reimburse the owners, operators, or their agents for their costs for corrective action. Reflecting the frequent amendments to the GWPA, NMED revised these regulations in December 1993, March 1994, December 1994, November 1995, April 1997 October 1999, June 2002 , and November 2003. The 1995 amendments added contractor certification and competitive bid requirements. The 2002 amendments made corrective action for releases from ASTs eligible for benefits from

the Fund.

5.2.1.7.1.1 Accomplishments of the Corrective Action Fund

By September 2003, a total of $124.58 million in state funds had been spent on corrective action at leak sites. Using state contractors, PSTB has taken direct action at over 100 sites, and PSTB has made over 13,000 payments to or on behalf of tank owners who took corrective action. NMED currently processes from 55 to 60 payments per month. Maintaining their eligibility for benefits from the Fund acts as a powerful incentive to tank owners to remain in compliance with the storage tank regulations, which, in turn, prevents pollution of New Mexico's water resources from leaking storage tanks.

5.2.1.8 Emergency Management Act

The Emergency Management Act, (§§ 74-4B-1 et seq., NMSA 1978) as amended in 1986 and again in 1989, is the statutory authority for New Mexico's hazardous materials emergency response program. Under the Act, the state government has the primary responsibility for management of hazardous materials incidents, including incidents contaminating surface or ground waters. Local governments assist the state in performing emergency response functions in their respective jurisdictions. The 1989 amendments provided that the Secretary of the New Mexico Department of Public Safety shall have the final authority to administer the provisions of the Act, and shall serve as the central coordinator to direct the response function of the state agencies which may be involved in a hazardous materials or radiological incident.

Under the authority of the Act, New Mexico developed a Hazardous Materials Emergency Response Plan (New Mexico Emergency Management Task Force 1986), which defines procedures and response functions of various state agencies. NMED is one of the agencies with responsibility for providing information necessary to control and mitigate hazardous materials and radiological discharge incidents.

NMED attempts to provide such information to those on-site entities at any incident that threatens the quality of the environment, or poses a threat to public health or safety. NMED contracts with the New Mexico Health Department's Epidemiology unit to receive and properly refer emergency incident reports. During a hazardous materials or radiological incident, NMED may provide technical assistance and advice, provide for environmental monitoring and sampling when necessary, ensure that adequate cleanup is performed, and take appropriate enforcement action. NMED staff, however, do not enter the exclusion zone during a hazardous materials or radiological incident. A contract is maintained with one or more firms with emergency response capability to furnish immediate response to emergency incidents. Work under contract is funded through the Hazardous Waste Emergency Fund established by § 74-4-8 of the New Mexico Hazardous Waste Act.

5.2.1.9 New Mexico Environmental Improvement Act

The New Mexico Environmental Improvement Act (§§ 74-1-1 et seq., NMSA 1978) was enacted in 1971. It established the Environmental Improvement Division (EID) of the Health and Environment Department. In 1991 EID was elevated to executive office cabinet-level status and redesignated the New Mexico Environment Department by the first session of the 40th Legislature. The Environmental Improvement Act also established the Environmental Improvement Board, consisting of seven members appointed by the Governor for terms not to exceed five years, and gave the Board authority to promulgate regulations in numerous areas relevant to environmental management and consumer protection. Among regulations adopted by the Board are several affecting ground water quality, including those described above in the section on the Hazardous Waste Act, as well as Liquid Waste Disposal Regulations, Solid Waste Management Regulations, and Regulations Governing Water Supplies.

5.2.1.9.1 Liquid Waste Program Regulations

Liquid waste is the wastewater discharged from homes and other establishments and normally includes wastes from toilets, baths, dishwashers, clothes washers, sinks, and garbage disposals. In situations where such wastes cannot be disposed of through a community sewage treatment plant, treatment and disposal must be accomplished through individual facilities. The potential problems from such systems vary

depending upon a number of factors, including the type and design of the system, the amount of waste to be discharged, nearness to surface or ground water, amount of precipitation, type of soil, area and slope of land involved, and pollutant loading density due to other discharges in the area.

In New Mexico it is estimated that there are over 220,000 on-site liquid waste disposal systems, serving approximately 720,000 people statewide. Approximately 5,300 new systems are installed each year according to program permitting records. Most of these systems ultimately discharge to ground water. Bacteriological, viral, and chemical ground water pollution can result from improperly sited, designed, constructed, and/or maintained individual liquid waste systems. On-site liquid waste systems have polluted more acre-feet of ground water, and more public and private supply wells than all other sources combined.

NMED's liquid waste program is directed at preventing and abating adverse environmental and public health effects from individual liquid waste systems receiving, treating, and disposing of up to 2,000 gallons of domestic wastewater a day. The large majority of such systems are 'conventional' systems consisting of a septic tank and drainfield serving a single residence. Where the standards cannot be met with installation of a conventional system due to site limitations, one of various recognized 'alternative' systems may be required. By nature, nearly all such systems are buried, which makes their location, configuration, performance, and even existence difficult to determine. Their major negative environmental impact, degradation of ground water quality, is gradual, cumulative, and extremely difficult to legally prove or to correct.

The Liquid Waste Disposal Regulations (LWDR) were first adopted by the Board in 1973, and were most recently amended in December 2003, and they are in the process of being amended again. They contain specific requirements that each system include a treatment unit and be situated in conformance with standards designated to protect surface and ground water from degradation. The regulations include provision for granting variances to the requirements in cases where it can be shown that site-specific conditions or additional treatment processes exist that will provide adequate protection. The regulations also allow the imposition of more stringent requirements where necessary to prevent a hazard to public health or the degradation of a body of water. The LWDR cover only systems that are exempt under the WQCC regulations which cover any system receiving more than 2,000 gallons a day design flow or any non-domestic waste.

The principal method for limiting the impact of microbiological and soluble chemical contaminant pollution due to liquid waste systems is to restrict the density of systems. Many subdivisions were platted, approved, and sold prior to the adoption of the current liquid waste disposal regulations. Lots platted prior to February 1, 1990 not meeting the current minimum lot size standard are still able to be developed with load rates greater than what current standards allow. While real estate developers have generally sought to subdivide property to the highest density legally permissible, this has resulted in restricting purchasers to using expensive alternative systems or using community subdivision wastewater systems. A certain number of lots exist that are simply not appropriate for conventional on-site systems, yet people desire to build and live on these lots. In such instances, advanced-treatment or non-discharging systems, lot expansions, and legitimate variance allowance are being required in areas with vulnerable aquifers.

Local city and county governments have legal authority for zoning and subdivision approval, as well as authority to adopt environmental protection standards as stringent or more stringent than the state's, if necessary. In those areas of environmental sensitivity or current ground water problems, the counties and municipalities are encouraged to exercise their authority to prevent further local degradation of ground water. NMED is seeking local government cooperation in requiring evidence of an approved NMED liquid waste permit before issuing building or mobile home moving permits. This would insure a higher percentage of installations meeting standards.

5.2.1.9.1.1 Enforcement

Enforcement activities generally result from information contained in a complaint to the local NMED office concerning a failed system or an improper installation. Nearly all complaints are followed up, and nearly all discovered violations are voluntarily corrected by the system owners without court action. It

should be noted that the violations most commonly found are obvious ones, such as system installation without a permit, improper proximity of a system to a well or watercourse, system failure such that raw sewage reaches the soil surface, or improper dumping of septage. Systems existing prior to November 1973, were 'grandfathered-in' and, as a consequence, so were any potential problems associated with them. Problems and complaints about these earlier systems concern cesspools, surfacing sewage, overflowing tanks, and illegal pumping. Correction of such problems often involves modification of the existing system or providing for new installations. When voluntary compliance cannot be obtained, NMED can file criminal charges in the local magistrate court, or issue a compliance order with penalties.

These regulations adopted under the authority of the Environmental Improvement Act control discharges from individual domestic septic systems. These systems are responsible for more instances of known ground water contamination in New Mexico than any other source. The reasons for the relative ineffectiveness of these regulations are: (1) system siting standards are applied at the time of installation or modification, and requiring existing system upgrades to meet subsequent more stringent standards is commonly impractical, so systems installed under less stringent standards are allowed to continue to discharge; and, (2) lots divided prior to the February 1, 1990 change in minimum lot size standards are still allowed to develop with on-site systems. Therefore, the hazard to ground water from these older systems, or from new systems allowed to be installed on lots divided prior to February 1990, is considered to be substantial. The primary available remedy consists of community collection, treatment and disposal, which is outside the scope of these regulations. NMED is encouraging that new residential areas be developed with decentralized “cluster” systems for wastewater treatment and disposal.

5.2.1.9.1.2 Septage

Another problem associated with liquid waste disposal is the disposal of the residual solids (i.e., septage) from septic tanks. Regular pumping of septic tanks is encouraged to preserve the capacity, and treatment efficacy, of disposal systems. Traditional methods for septage disposal (i.e., to municipal wastewater treatment plants and landfill pits) are facing increasing question as to their environmental safety. Municipal wastewater treatment plants face ever-increasing pressures for compliance with stricter NPDES effluent limitations, and are sometimes unwilling to bear the costs associated with treating septage. Landfill operators are faced with legal liability for contamination from septage disposal and find that public land administrators are less willing to take the liability associated with accepting septage disposal to pits. Also, the New Mexico Solid Waste Management Regulations ban disposal of liquids at landfills. In the arid southwest, the most environmentally beneficial method of disposal of septage derived from residential sources would involve wide-area land application with incorporation into the soil in areas where there is no threat to surface or ground waters. However, this procedure has largely been precluded by EPA's technical criteria for sludge (including septage) that was published in February 1993 pursuant to the federal CWA. The number of septage disposal sites for which approval is sought under WQCC Regulations has continued to increase in the most recent biennium, but the number of approved sites still falls far short of the need. Illegal dumping of septage into sewers, watercourses, or arroyos is practically impossible to prevent. Such practices will predictably increase unless safe, legal methods are defined and promoted. A database of septage hauler businesses and facilities that are permitted to receive septage for disposal in New Mexico has been developed for NMED. Additionally, guidelines for septage disposal are also under development.

5.2.1.9.2 Public Drinking Water Supply Programs

Nearly ninety-two percent (92%) of New Mexico residents obtain their water from a public water supply system. Of the roughly 1,300 public water systems in the state, nearly ninety-one percent (91%) rely exclusively on ground water. The remaining public water systems rely either exclusively on surface water (lakes and reservoirs or stream intakes), or a combination of surface and ground waters.

Since the 1920s, anthropogenic ("human-made") contaminants have impacted nearly two hundred public water supply wells in New Mexico. More than half of these wells have been taken out of service.

Water from impacted wells that remain in service is either treated to remove impurities or is blended with water from other wells to reduce contaminant concentrations to acceptable levels. Common anthropogenic contaminants affecting New Mexico's public water supply systems are coliform bacteria and nitrate, originating from improper disposal of human and animal waste, and volatile organic contaminants (VOCs) originating from such sources as underground storage tanks or underground injection of solvents. Common naturally occurring elements, with potential human health risks, affecting New Mexico's public water systems include arsenic, fluoride, radium, radon, selenium, and uranium.

5.2.1.9.2.1 The Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), enacted by the United States Congress in 1974, had as its primary purpose the promulgation of national, enforceable standards for drinking water, and the implementation of a monitoring scheme to ensure that public water systems continue to meet those standards. The Act established Maximum Contaminant Levels (MCLs) for twenty-two (22) known chemical contaminants, and set non-enforceable Secondary MCLs for chemical constituents that may adversely affect the aesthetic qualities of drinking water. The Act was amended in 1986 with the establishment of the Drinking Water Priorities List, which is a list of contaminants "known or anticipated to occur" in pubic water systems that pose a health risk and that may warrant regulation under the Act. The 1986 amendments also provided for periodic revision of the priority list of contaminants slated for a drinking water standard review, called a candidate contaminant list, and expanded the Act's original mandate for chemical monitoring and reporting activities to include ground water pollution prevention measures.

The Act was amended again in 1996 (PL 104-182) with new guidelines for the protection of the nation's public water systems. Congress, in amending the Act, was relying on a good working partnership between the states and the EPA to carry out these new provisions. Among other refinements, the 1996 amendments made the following changes:

- Repeal of the mandate that twenty-five new contaminants be added to the Contaminant Candidate List every three years. Additions to the priority list are now required only if a contaminant exists in significant and sufficient areas to warrant regulation (1412 SDWA);
- The incorporation of sound scientific data and risk assessment into the criteria for establishing water quality standards. Also, included in the amendments was an increased flexibility for states to tailor monitoring and treatment requirements for all water systems and to grant variances and waivers to small systems (1412 SDWA);
- Specification of minimum standards for the certification (and recertification) of operators of community and noncommunity public water systems (1419 SDWA);
- The requirement for state drinking water programs to establish a Capacity Development Program to assist water systems to acquire and maintain the technical, managerial, and financial capabilities necessary to consistently provide safe drinking water (1420 SDWA);
- Provisions for a federal financial assistance program administered by the states as a Drinking Water State Revolving Loan Fund. This fund provides low interest loans to water systems for capital improvements and other water-related activities (1452 SDWA); and
- Increased emphasis on the protection of drinking water sources from contamination, instead of on the detection and treatment of contaminants after they occur (1429, 1453 and 1454 SDWA);
- Revised standards for treatment techniques to reduce turbidity in public water systems using surface water sources.
- Mandated that EPA set new or revised standards for some naturally occurring ground water chemical constituents in New Mexico such as radon, radionuclides, and arsenic.

There is no federal drinking water standard for radon at the present time. Although the primary risk from radon is through breathing it in indoor air, present sampling data suggest that radon could occur in 84% of New Mexico's water supply wells. Annual treatment costs to remove radon from water supplies could be

substantial, depending on the level at which EPA sets the standard. In the draft EPA regulation, states are encouraged to adopt a Multi Media Mitigation (MMM) program. A MMM program would require the state Indoor Radon and Drinking Water programs to work together to decrease radon levels in homes. As a result, states with MMM programs for indoor air will be required to meet a less stringent alternate MCL for drinking water.

EPA promulgated a revised MCL for arsenic in January 2001. Because of the debate surrounding the appropriateness and the cost of the 10 ppb standard (particularly for small water systems), the EPA Administrator sought additional independent expert reviews of the January 2001 regulation. In October 2001, the EPA affirmed that it was appropriate to set a national maximum contaminant level of 10 μg/L for arsenic. The cost to remove arsenic from public drinking water for New Mexico's water systems is estimated at $400 million. Systems can apply for variances and exemptions to lessen the economic impact of new rules and regulations.

Water systems throughout New Mexico will also be affected by the revised rule for radionuclides, which regulates gross alpha radioactivity, combined activity from the radium isotopes radium-226/radium-228, and uranium. These naturally occurring radionuclides have been observed to accumulate to levels of concern in drinking water sources. EPA estimates that this new rule will reduce the exposure to radionuclides in drinking water and therefore reduce the risk of cancer by four cases per 100,000 people per year. Implementation of the radionuclides rule may require drastic water system infrastructure improvements since higher levels of radionuclides tend to be found more often in ground water, the major source of drinking water in New Mexico. Beginning in December 2003, public water systems will be required to monitor and maintain compliance with the standards set in this rule.The cost to remove these naturally occurring contaminants from public drinking water will be substantial. In addressing these EPA-mandated contaminants (particularly radon, radionuclides, and arsenic), the state will institute more sampling waivers for those systems not demonstrating occurrence of or vulnerability to the contaminants.

The SDWA was amended in 2002 under the Bioterrorism Act (PL 107-188) to require public water systems serving more than 3,300 water users to conduct security vulnerability assessments and prepare emergency response plans. Grants were awarded for staff to assist the communities with the assessments and plans. The state was also awarded an Operator Reimbursement grant to help pay for training for operators of small water systems.

5.2.1.9.2.2 Capacity Development Program

New Mexico's Capacity Development Strategy was developed and approved by EPA in September 2000. The strategy is being implemented and includes a variety of options for the state to provide financial, technical, and managerial assistance to its public water systems. This program is meant to support the needs of all water systems with particular emphasis on small and disadvantaged water systems.

Implementation of current and new drinking water regulations may require extensive water system upgrades or the installation of new treatment systems. While such upgrades may increase the capacity of water system to deliver safe drinking water, they also impose a significant financial burden on New Mexico's smaller water systems. In recognition of this cost burden, the 1996 Amendments created a funding mechanism through the Capacity Development Program to meet these challenges.

Water system improvements are especially critical in New Mexico, where many of our aging water systems, have inadequate components such as improper or insufficient disinfection, failing storage tanks or leaking distribution systems, or simply need technological upgrades in infrastructure. By implementing the Capacity Development Program, the Drinking Water Bureau has instituted a strategy through which water systems and their board members may receive technical, managerial, and financial training through professional services contracts.

The Capacity Development Program involves extensive on-site assistance and training of both operators and boards by DWB staff and contractors. The focus of these efforts is on water system inadequacies

or problems, both long-term and short-term. In addition, in the summers of 2002 and 2003 DWB staff provided intensive support to northern and southern New Mexico water systems with drought-related water outages. This support is critical for the capacity program, as water outages basically occur because of limited water system capacities.

Through the Capacity Development Program, a water system, with adequate managerial, financial and technical capacity are eligible to apply for the Drinking Water Revolving Loan Fund (DWRLF). The purpose of the DWRLF is to improve and protect drinking water quality and public health by providing community water systems in New Mexico with low-cost financial assistance in the construction and refurbishment of necessary drinking water facilities. Program responsibilities are shared between the New Mexico Finance Authority (NMFA) and the NMED. The effect of the collaborative effort provides a more efficient use of state, federal and local funds and a more centralized and coordinated approach to support of public health and water infrastructure financing.

5.2.1.9.2.3 New Mexico's Drinking Water Regulations

The Environmental Improvement Board (EIB) promulgates the Drinking Water Regulations (DWR), which regulate New Mexico's public water supply systems. NMED has the primary responsibility for enforcing the regulations under the authority of the Environmental Improvement Act and the federal SDWA. Primacy is the way the DWB maintains the ability to administer, implement and enforce drinking water regulations and related requirements applicable to public water systems in the state. In order to retain primacy, the state regulations were revised effective December 4, 2002, to incorporate federal regulations in 40 CFR 141 and 143 by reference. This included adoption of eleven rules pursuant to the SDWA 1996 amendments. New Mexico received such primacy approval in October 2003. EPA reported that in comparison to other states, New Mexico is way ahead in adopting federal regulations that were promulgated as a result of the 1996 amendments to the SDWA. Such rules as the arsenic and radionuclides rules are included in these amendments.

The first session of New Mexico's 39th Legislature empowered NMED to collect fees from water supply systems for services (such as water monitoring samples) provided to assist in complying with new requirements under the SDWA amendments. In 1993, this fee based on water production and called the Water Conservation Fee, was established in New Mexico to pay for sampling and analysis of public water supplies, which would otherwise have been the financial responsibilities of each water system.

Most requirements of the state regulations pertain to the quality of water delivered (i.e., end of pipe) by public water supply systems. Other provisions provide for protection of public health by setting requirements for siting, construction, operation, and maintenance of public water supply systems.

Out of the over 1, 300 public water systems that NMED currently regulates, about 500 are classified as '*non-community water systems,*' which are sampled for nitrates once every four years. There are about 650 '*community systems*' which are sampled for nitrates, fluoride, and trace elements (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) once every three years; for radiological parameters (gross *a* (alpha), radium^{226}, radium^{228}, and uranium starting December 2003) every four years; and eight regulated organic chemicals and 51 other contaminants sampled once every three to five years, depending on the vulnerability of the water supply sources. Monitoring for trihalomethanes (a by-product of disinfection) is required annually for water systems serving populations greater than 10,000. Beginning in December 2003 populations serving less than 10,000 will also be required to monitor for trihalomethanes. There are about 150 water system in New Mexico classified as "*non-transient non-community"* public water systems that serve schools, factories, etc., that are sampled for many, but not all, of the contaminants required to be sampled by community systems. NMED samples chemical parameters utilizing the Water Conservation Fund resources.

All public water supply systems are required to conduct periodic microbiologic analyses. Analyses consist of total coliform presence or absence and are performed on a monthly basis for most systems. State-

required microbiological monitoring is usually performed by the water supply operator, and is funded through the Water Conservation Fund.

In addition to the total coliform presence or absence test, surface water systems are required to monitor for turbidity. High levels of turbidity in water can interfere with disinfection and provide a medium for microbial growth, which can present a health hazard. Coagulation, flocculation, and filtration remove turbidity and pathogenic organisms. New rules require more advanced treatment and better-trained operators. Comprehensive performance evaluations are required if treatment techniques are not effective in removing turbidity.

5.2.1.9.2.4 Source Water Assessment and Protection Program

The New Mexico's Source Water Assessment and Protection Program (SWAPP) is a federally and state funded program that follows on earlier drinking water protection programs and initiatives largely mandated by the *federal Safe Drinking Water Act* (SDWA). In 2003, SWAPP was reorganized into a composite program that incorporates all elements of the state's Wellhead Protection and Source Water Assessment programs, and includes surface water protection efforts as well. The United States Environmental Protection Agency (EPA) approved the SWAPP in November 1999, and is an information-gathering tool that follows on earlier drinking water protection initiatives mandated by the federal Safe Drinking Water Act.

The ultimate goal of the SWAPP is to generate active community involvement in the management and protection of public drinking water supplies as part of New Mexico's precious water resources. SWAPP is accomplished by assessing the susceptibility of groundwater and surface water sources to potential contamination, and working with communities, water utilities, and other service providers to develop protection plans largely based on these findings. The six steps necessary to implement SWAPP are as follows:

1. Formation of a Community Planning team.
2. Delineation of Source Water Protection Areas (NMED-DWB completes this Step).
3. Inventory of Actual and Potential Sources of Contamination (NMED-DWB completes this Step).
4. Susceptibility Analysis (NMED-DWB completes this Step).
5. Development of a Management Strategy (NMED-DWB provides assistance).
6. Development of a Contingency Protocol / Planning for Existing and Future Events (NMED-DWB provides assistance).

The SWAPP is accomplished by determining the source water protection area surrounding each water source, identifying potential sources of contamination, evaluating the susceptibility of wells and surface water intakes to contamination, and working with all water resource stakeholders such as communities, water utilities, and service providers to develop Source Water Protection strategies.

1. Determining the source water protection area for the water system.
2. Taking inventory of actual and potential contaminant sources within the source water protection area.
3. Determining the susceptibility of the source area and water system to contamination.
4. Reporting the SWAPP findings to the water utility, its customers, and the community.
5. Working with the community and other stakeholders to implement source water protection measures that safeguard and sustain the water supply into the future.

The Source Water Protection area is the land around each supply well or surface water intake where spills, leaks, accidents, or other forms of contamination may have a direct impact on the drinking water supply. The size of this area depends on soil type, site geology, groundwater flow rate, and on the drainage area and land use in the watershed. The susceptibility of drinking water sources to contamination is based on the number and proximity of potential threats to the water supply and an evaluation of any sanitary defects at the wellhead, intake structures, or other components of the water system.

Potential sources of contamination are derived from industries, businesses, and other activities that produce, use, distribute, or handle contaminants that have an established Maximum Contaminant Level

(MCL) under The Safe Drinking Water Act. Generators of microbiological and pathogenic organisms are also included in the contaminant inventory.

Some potential sources of contamination include septic tanks and their leachfields, hazardous waste sites, mining activities, industrial and commercial areas, stormwater runoff, pesticides and fertilizers, animal and human waste disposal, petroleum storage tanks, agrichemical application sites, chemical spills, household waste, landfills, and illegal dumps.

All public water systems are anticipated to receive SWAPP reports by the close of December 2003, and by the close of CY 2005, NMED-DWB anticipates the approval and adoption of protection plans for 50% of these systems. Through state executive branch recognition for plan adoption, it is hoped that water utilities will help lead communities through the protection planning process.

Public involvement is a critical component of the New Mexico SWAPP, and a shared sense of responsibility and involvement is key to source water protection. Public participation in development and implementation of a source water protection plan helps to create awareness within a local community of the issues and hazards that may confront that community's water supply, and is a far more effective tool in preventing pollution than are laws and regulations. Community-based planning efforts may be tailored specifically to the community's needs.

5.2.1.10 New Mexico Solid Waste Act

New Mexico has responded to increasing discoveries of ground water pollution below old landfills and the additional perceived threat of large-scale disposal of other states' solid waste in New Mexico.

In 1990, the State Legislature passed the Solid Waste Act. This law (§§ 74-9-1 through 74-9-42 and §§ 74-9-72 through 74-9-73, NMSA 1978) mandated development of a comprehensive statewide solid waste management program. It also authorized NMED to impose fees for processing permit applications, seek increased penalties for noncompliance, and expand facility requirements for permitting and financial responsibility. The Act was amended in 1993 and required local governments to provide financial assurance and established permit life criteria for private and public entities while expanding the public notice requirements to tribal governments. In October of 1991, EPA promulgated the federal Part 258 requirements for municipal landfills, which became effective in October of 1993. Certain options were provided to states that could demonstrate that their permit programs were sufficient to implement requirements equivalent to the federal criteria. In response to the amendments to the Solid Waste Act, the promulgation of the federal criteria, and recommendation provided in a statewide solid waste management plan, the Environmental Improvement Board adopted extensive amendments to the regulations on July 8, 1994. The regulations became effective on August 17, 1994. Application to EPA for federal approval of the state program was made on July 18, 1994 was received on December 21,1994.

The Solid Waste Management Regulations, 20.9.1 NMAC establish permit requirements for landfills, recycling facilities, processing facilities (preparation of waste for reuse), special waste (waste with unique handling, transport or disposal requirements ~ such as asbestos and infectious waste), composting facilities, transformation facilities (e.g., incinerators, distillation and gasification operations), and transfer stations. Particular categories of waste handling and disposal facilities are governed by specific siting and design criteria, operational requirements and closure and postclosure requirements. Financial assurance is required for closure and postclosure care and ground water monitoring. Certified operators are required for most solid waste facilities. Where monitoring wells show ground water contamination, remediation is required. Numerical standards for water quality parameters are established, and for contaminants with potentially serious health, safety or environmental effects, remedial action levels are generally set at 75 % of the standards. The standards the board adopted are at least as stringent as those the WQCC adopted.

5.2.1.10.1 Solid Waste Disposal

The most widely used method of solid waste disposal is land disposal. As of January 2002, there are approximately 40 active landfills operating in New Mexico of which 30 are municipal, 2 are federally

owned, and 8 are privately owned. Since 1989, approximately 160 landfills have closed, with a number of them being replaced with transfer stations for eventual transport to other landfills. More landfills are expected to close to avoid the additional requirements imposed by the 1994 regulations, which are equivalent to the federal Part 258 requirements. It is expected the requirements of the Act and regulations will result in fewer, larger, better-located sites that will afford significantly increased protection of water resources.

The regulations, which became first became effective on January 31, 1992, provide a basis for adequate protection of the surface and ground water resources. They require permits for new and existing facilities that require geologic and hydrologic evaluations of sites.

5.3 OTHER STATE PROGRAMS

There are several other state programs that contribute to the protection of ground water quality. These are summarized below and also are listed in Appendix E.

5.3.1 GROUND WATER STORAGE AND RECOVERY ACT

The recently adopted Ground Water Storage and Recovery Act (§§72-5A-6 et seq., NMSA 1978) authorizes any governmental entity to apply for and obtain a permit from the State Engineer to transfer existing surface or ground water rights to underground aquifers where the stored water may be recovered for future use by the permittee through ground water pumping. Permitted projects allow the permittee to add measured volumes of water by injection or infiltration to an aquifer or system of aquifers, to store the water underground, and to recover it for beneficial use. Water added to an aquifer to be stored for subsequent recovery for beneficial use pursuant to a project permit is not public water and is not subject to forfeiture.

In adopting the Ground Water Storage and Recovery Act the legislature found that ground water recharge, storage, and recovery have the potential to:

1. offer savings in the costs of capital investment, operation and maintenance, and flood control and may improve water and environmental quality;
2. reduce the rate at which ground water levels will decline and may prevent overstressing or dewatering aquifer systems;
3. promote conservation of water within the state;
4. serve the public welfare of the state; and
5. may lead to more effective use of the state's water resources.

5.3.2 COAL SURFACE MINING REGULATIONS

The protection of ground water quality at coalmines is controlled under the Coal Surface Mining Regulations adopted by the Coal Surface Mining Commission pursuant to the New Mexico Surface Mining Act (§§ 69-25A-1 et seq., NMSA 1978). The regulations are administered by the Mining and Minerals Division of the Energy, Minerals and Natural Resources Department. This Division also administers programs under the Abandoned Mine Reclamation Act (§§ 69-25B-1 et seq., NMSA 1978).

5.3.3 HARD ROCK MINING REGULATIONS

Permitting of hard rock mines is required pursuant to the New Mexico Mining Act (§§ 69-36-1 to 69-36-20, NMSA 1978) that is administered by EMNRD's Mining and Minerals Division. Rules to implement the Mining Act were adopted by the newly created Mining Commission in 1994 and have been amended a number of times. New and existing mining operations and exploration operations must obtain Mining Act permits that include reclamation or closeout requirements. The Mining Act requires the issuance of these permits to be closely coordinated with other established regulatory programs including NMED's ground and surface water protection programs, in order to ensure that conflicting and/or duplicative requirements are not imposed on facilities. A key provision of the Mining Act is a requirement that the Secretary of NMED pro-

vide a determination that environmental standards, including water quality standards, are expected to be met, before a new mine permit or a closeout plan for an existing mine can be approved.

5.3.4 PESTICIDE USE AND DISPOSAL

The use and disposal of pesticides is controlled under 21.17.50 NMAC under the New Mexico State University Board of Regents. This order was adopted pursuant to the Pesticide Control Act (§§ 76-4-1 et seq., NMSA 1978) and is administered by the Division of Agricultural and Environmental Services of the NM Department of Agriculture. This regulatory order does not include specific provisions to protect ground water quality. However, the Department of Agriculture is developing a generic Pesticides State Management Plan Guidance for Ground Water Protection that will focus on management of pesticides to prevent negative health and environmental effects.

5.3.5 Office of the State Engineer

The New Mexico Office of the State Engineer has authority under several statutes (§ 69-3-6, § 70-2-12.B (15), §§ 72-12-1 through 72-12-28, § 72-13-4 and § 72-13-6, NMSA 1978) to control activities affecting ground water quality. New Mexico Supreme Court decisions have further defined this authority (Appendix E). The State Engineer has general supervision of certain water quality issues in the state. His office has authority over plugging mine discovery or drill holes, drilling, casing, and plugging artesian wells to prevent commingling, pumpage control to prevent salt water encroachment, and designation of aquifers to be protected by the OCD.

The 1991 Legislature amended state law to provide that periods of non-use during which water rights are placed in a water conservation program approved by the State Engineer and prepared by a conservancy district, acequia or community ditch or the Interstate Stream Commission (ISC) are not computed as part of the four-year forfeiture period.

In 1987 the New Mexico Legislature authorized the ISC to appropriate ground water or purchase water rights on behalf of the various regions of the state and to make grants or loans for the purpose of regional water planning. The purpose of the regional water planning effort is to identify future water needs and to develop information needed to conserve water for future use. From 1987 through 1998, the Legislature has appropriated over $2,500,000 for the preparation of regional plans. In 1998 and in 2001, the Legislature appropriated an additional $3.25 million for completion of regional and statewide water planning. This program has funded initial water planning efforts in water planning regions that cover 32 of New Mexico's 33 counties. Statewide water planning includes investigations into gaging and stream monitoring infrastructure and an update of the 1976 assessment of New Mexico water resources for planning purposes which include an investigation into ground water.

5.3.6 STATE LAND OFFICE

The New Mexico State Land Office (SLO) administers approximately 9,000,000 acres of surface estate and 13,000,000 acres of mineral estate held in trust for New Mexico schools, universities, and other beneficiaries. By state statute, the agency is required to maximize the long-term return to the Trust and protect the resource. The SLO is not authorized to expend Trust funds for improvement of Trust Land; however, federal Agricultural Stabilization and Conservation Service funds or private funds may be expended by lessees to improve Trust Lands.

SLO has developed and is enforcing reclamation standards for oil and gas development, in addition to a road policy that contains elements of appropriate Best Management Practices designed to control sediment, erosion, and other pollutants. SLO has also revised its sand and gravel lease procedure to (1) require a spill prevention and control plan that outlines leak and spill prevention methods and subsequent cleanup

methods of any accidental spills; (2) require water diversion ditches up-gradient and runoff berms downgradient from the operation to prevent sediment runoff; (3) enforce stringent reclamation requirements; and is (4) currently developing the requirement of a systematic field inspection schedule for active sand and gravel leases.

SLO encourages its agricultural lessees to enter into Great Plains Contracts or ranch/farm plans with the federal Natural Resources Conservation Service, which provides information and encourages proper range management practices. In an effort to promote the longterm health of New Mexico's range resources, SLO has designed a program that rewards lessees who excel in managing state Trust Lands called the Range Stewardship Incentive Program. The central feature of this voluntary program is a 25 % fee reduction on each acre in good or excellent condition with a stable or upward trend. By definition, there is minimal erosion and therefore minimal nonpoint source pollution from rangeland in high ecological condition. Approximately 325,000 acres are currently managed under this program.

SLO has made Educational Easements available to schools to provide the opportunity to teach environmental education and enhance student understanding of resource issues and the need for protection of the Trust resource for future generations. SLO has worked with NMED concerning surface water monitoring and ground water discharge plans and reviews discharge proposals for potential impacts to the Trust resources regarding surface and ground waters. The agency is active in the Upper Rio Grande Basin Ecosystem Management Project, the Zuni River Watershed Project, the Statewide Water Plan, and the Riparian Council. In addition to the above, leasing of state Trust Lands for mining, grazing, rights-of-ways, and commercial use is being reviewed to address biological, archaeological, and other environmental concerns, and to apply appropriate stipulations to the leases in order to protect the quality of ground and surface waters.

Additional programs initiated by SLO include a riparian improvement program (RIP) whose purpose is to identify, prioritize, and implement restoration projects in riparian areas and associated watersheds located on state trust lands in cooperation with lessees, adjoining land owners, and land management agencies. SLO has also initiated a program to identify and control noxious weeds found on state trust lands. The program relies on cooperative efforts with land management agencies, county governments, and other interests to prevent to the extent possible the spread of noxious weeds and the consequent loss of productive agricultural lands.

5.4 PUBLIC INVOLVEMENT

In New Mexico public involvement is an important aspect of programs to protect ground water quality. Public participation includes public notices, opportunities for public hearing, and the formation of advisory groups for regulation development and revision and the recommendation of public policy. Public recognition is given to businesses and organizations that have shown excellence in their efforts to protect the state's ground water. An example is given below.

5.4.1 WATER FAIR PROGRAM

At one or two-day water fairs, NMED, cooperating agency staff, and local volunteers set up a field laboratory and conduct free testing of drinking water samples collected by citizens from their private wells. Public concern about contaminated private wells led NMED to develop a program to conduct free tests for nitrate, pH, organic vapor, conductivity, iron, sulfate, and fluoride. Although the information is suitable only for screening purposes, follow-up samples are collected for laboratory analysis when health-threatening pollutants are detected at levels of concern. In this situation, the well users are advised of proper steps to take to protect themselves and a referral is made to the proper ground water program so that the source of contamination can be identified. Water fair results may be used to facilitate development of new public wa-

ter supplies or extension of existing services.

In addition to water quality test results, visitors to a water fair are provided with health and pollution prevention information. Published in English and Spanish, packets include fact sheets about water-borne diseases, health risks from drinking contaminated water, household toxics and pesticides, and information about typical sources of ground-water contamination in New Mexico (McQuillan, Richards and Parker 2000). Water fairs bring water scientists to small communities where they are available to discuss ways to protect ground water and proper waste disposal while answering questions about our ground water resource. The generated ground water information becomes available to the public and all NMED programs.

5.5 FEDERAL PROGRAMS RELATED TO GROUND WATER QUALITY

There are a number of federal programs that contribute to ground water quality protection in New Mexico. Some of these, such as the hazardous waste, underground injection control, and underground storage tank programs, are being carried out by the state under authority of state legislation and are described in the sections on the relevant state acts. Others, such as Superfund, are essentially federal programs in which the state plays a role.

5.5.1 DEPARTMENT OF ENERGY ENVIRONMENTAL OVERSIGHT AND MONITORING PROGRAM

The four DOE facilities in New Mexico are Sandia National Laboratories (SNL) and the Lovelace Respiratory Research Institute (LRRI), formerly the Inhalation Toxicology Research Institute (ITRI) in Albuquerque, the Los Alamos National Laboratory (LANL) in Los Alamos, and the Waste Isolation Pilot Plant (WIPP) in Carlsbad. The New Mexico Agreement-in-Principle is designed to help assure that activities at DOE facilities are protective of the public health and safety and the environment. To accomplish the goals of the agreement, an oversight program was developed with four primary objectives:

- To assess the DOE's compliance with existing laws including regulations, rules, and standards;
- Prioritize cleanup and compliance activities;
- Develop and implement a vigorous program of independent monitoring and oversight; and
- To communicate with the public so as to increase public knowledge of environmental matters about the facilities, including coordination with local and tribal governments.

The DOE Oversight Bureau carries out the oversight and monitoring activities of the program. Although the Oversight Bureau has no regulatory status, it facilitates compliance with applicable environmental regulations by reporting water quality concerns and infractions to DOE and the appropriate regulatory NMED bureaus (i.e., Surface Water Quality, Ground Water Quality, and Hazardous & Radioactive Materials). DOE Oversight Bureau staff communicate routinely with the public to increase public knowledge of oversight, monitoring, and environmental issues involving the facilities. The Oversight Bureau issues quarterly and annual implementation reports to the DOE describing the scope of work, objectives, accomplishments, and significant issues that occurred during each period. Results of oversight and monitoring activities are also available to the public along with numerous documents transmitting technical comments and concerns relative to specific program areas. These reports and documents are a source of reliable technical information for the writers of facility proposals and decision makers at regulatory agencies.

5.5.1.1 Ground Water Protection at DOE Facilities

NMED is responsible for preserving, protecting, and perpetuating the state's ground water resources for future generations. The oversight program accomplishes this at DOE facilities through review and technical investigation in four broad areas: site wide and site-specific hydrogeology, waste management, surveillance, and environmental restoration. Oversight Bureau staff evaluate the facility's conceptual hydrogeologic model, review the facility's investigations to improve their conceptual model, and conduct studies necessary to better understand the hydrogeologic systems and to support technical recommendations at the facilities.

One of the early NMED deliverables in the oversight program was an assessment of the ground water surveillance at each facility. This involved evaluating the adequacy of existing ground water monitoring networks and practices at the facilities, in view of their hydrogeologic setting and the location, number and character of waste disposal sites. On-going surveillance activities include sampling and co-sampling of ground water at wells and springs; compiling a database of previous analytical results, as well as determining and investigating any trends in the concentration of constituents of concern.

For information on ground water and surface water data, conclusions and recommendations from oversight and monitoring at New Mexico DOE Facilities see the NMED report titled *Initial Inspection of Site Water Systems and Wells at DOE Facilities in New Mexico*, (Stone, Monahan and McDonald 1993) which satisfies X.A.B.3, Action No. 17 of the DOE/NMED Agreement in Principle.

5.5.2 SUPERFUND

The 1980 federal Comprehensive Environmental Response, Compensation and Liability Act (Superfund), as modified by the Superfund Amendments and Reauthorization Act of 1986 (SARA), provides for cleanup of inactive hazardous waste sites ranked on the National Priorities List (NPL). Superfund also provides for emergency response by the EPA to clean up hazardous waste sites that pose an imminent hazard to public health or the environment. Superfund further directs EPA to determine liability for improper hazardous waste disposal and to recover costs from responsible parties for cleanup. Finally, Superfund provides a mechanism for states and others to file claims to gain compensation for damages to natural resources.

With the exception of the emergency incident provisions of the Hazardous Waste Act that has limited applicability, New Mexico has no state-funded program to address the problems of inactive or abandoned hazardous waste sites. EPA administers the federal Superfund program and is the lead agency for most Superfund activities in New Mexico. NMED maintains a Multi-Project Cooperative Agreement with EPA. This agreement provides 100 % federal funds to allow the state the lead role in certain projects and to permit state involvement in projects where EPA is the lead agency. The state takes the lead role in identifying and investigating potential new Superfund sites. Approximately 20 sites are investigated each year. The most serious sites are scored using the Hazard Ranking System and are nominated for the NPL. Nationally, there are approximately 1,236 sites on this list.

Twelve New Mexico sites are currently included on the NPL: Albuquerque South Valley Site; United Nuclear Corporation Uranium Mill Tailings in McKinley County; Homestake Mining Company Uranium Mill Tailings in Cibola County; Atchison, Topeka and Santa Fe Railroad sites in Clovis and Albuquerque; Prewitt Refinery in McKinley County; Lee Acres Landfill in San Juan County and Cimarron Mining Company in Lincoln County; the North railroad Avenue Plume site in Española, Rio Arriba County; and the Fruit Avenue plume in downtown Albuquerque, Bernalillo County. The Griggs and Walnut Ground Water Plume Site in Las Cruces was added to the NPL in June 2001. The Molycorp Mine Site in Taos County was proposed to the NPL in May 2000, but has not been officially added to the NPL.

EPA is the lead agency for the required Remedial Investigations and Feasibility Studies at these sites with the exception of the North Railroad Avenue Plume site in Española. EPA funds NMED to participate

in these projects by reviewing and commenting on workplans, proposals, and reports. Federal law requires New Mexico to pay ten percent of final Superfund remedies when federal Superfund money is used for remedial actions.

Superfund has conducted several time-critical removals in New Mexico. EPA investigates candidates for time-critical removals and performs the cleanups, if deemed necessary. NMED works with EPA to determine when such action is necessary. Between January 2001 and December 2003, NMED was involved with the removal action at two sites and removal assessment at one site.

Between January 2001 and December 2003, NMED's federally funded Superfund Program completed 25 site investigation deliverables requiring varying degrees of effort. These investigated sites can be categorized as follows: 17 solvent sites; 3 mining sites, 1 landfill, and 4 other sites. Several sites have received more than one level of investigation.

The Superfund Program has also provided management assistance to EPA on 9 EPA-lead NPL sites that have required varying degrees of effort from reviewing and supplying comments to creating reports such as *Human Health and Ecological Risk Assessments* and overseeing Administrative Orders on Consent.

5.6 OTHER GROUND WATER QUALITY MONITORING

5.6.1 MORE FEDERAL PROGRAMS

Please see the citations for the Office of Technology Assessment's Protecting the Nation's Ground Water from Contamination (1984) and the Environmental Protection Agency's Protecting the Nation's Ground Water: EPA's Strategy for the 1990s (1991) for summaries of federal programs, including some of the programs described below.

5.6.1.2 U. S. Geological Survey

USGS, through its Water Resources Division's District Office in Albuquerque, often obtains information on the quality of ground water as part of limited duration studies conducted in New Mexico. These studies are conducted for specific ground water systems in cooperation with state, local or other federal agencies. Information about these and other activities are available through bibliographies and catalogs of information. USGS also publishes "Water Resources Data New Mexico," an annual report which includes ground water levels and water quality data. The report explains how to obtain access to WATSTORE, the national water data storage and retrieval system established for handling water data collected through the activities of USGS, and for providing an effective and efficient means of releasing the data to the public.

5.6.2 MORE STATE PROGRAMS

5.6.2.1 Office of the State Engineer

The Office of the State Engineer along with the SWCD, the SPD, and the USGS cooperate in ground water quality monitoring in conjunction with the State Engineer's primary mission of administering use of the state's water resources. Areas from which extensive salinity data are available include the Roswell and San Juan Basins, the Bolson-Mesilla Valley, and Curry and Roosevelt Counties.

5.6.2.2 Other Sources

Other organizations who collect, record, or make use of other sources of ground water data to create useful reports include the New Mexico Water Resources Research Institute, the New Mexico Agricultural Extension Service, the EMNRD’s Mining and Minerals Division, and New Mexico Bureau of Geology and Mineral Resources. The BLM also undertakes monitoring activities under its statutory authority.

5.6.3 GROUND WATER QUALITY MONITORING AND DATA MANAGEMENT

During the past several decades, numerous federal, state, and other government agencies have generated a large body of ground water quality and related data in New Mexico. Also, large amounts of data concerning known and potential contamination sources are kept by various entities. There is, however, no comprehensive bibliographic or data retrieval system for all ground water quality resources in New Mexico.

The plethora of ground water-related databases creates two major problems. First, it is difficult for water quality investigators to acquire comprehensive information needed, for example, to establish background water quality conditions. Secondly, information pertaining to historic water quality problems has often been filed away, forgotten, or otherwise effectively lost. This situation creates unnecessary hardships for those who must deal with new developments in such cases. Poorly accessible information may cause investigators to arrive at erroneous conclusions, repeat past investigations or spend excessive amounts of staff time obtaining data.

Progress has been made during the past few years to rectify some of the above problems. A major effort to computerize data management systems within NMED has been undertaken. Also efforts to integrate state and federal data systems have been started.

There is a widespread need to share ground water data between programs within NMED. In part because of this need, the NMED has purchased an off-the-shelf database software package and is in the process of configuring the system to meet NMED needs. *Tools for Environmental Management and Protection Organizations* (TEMPO) software has been installed and modified to integrate existing data management and business processes. New initiatives including the web portal and incorporating *Geographic Information Systems* (GIS) will enable the public to readily view more environmental data than ever before. Data exchange within department and with several federal government partner agencies will be streamlined and enhanced.

One purpose of this system is to make data sharing among NMED programs easier by having programs transform any databases currently stored on personal computer systems and different schemas in the Oracle database to a single department database. This solves the problem of having data on stand-alone independent computer systems using incompatible hardware and software and widely varying data formats and eliminates various pockets of data in the existing Oracle database. The result of this new computer system will be to facilitate data exchange within NMED, as well as enhance electronic communication with EPA.

One problem that NMED has experienced in utilizing the new computer system is the ability to enter analytical ground water data. Analytical data are received from a wide variety of sources and the data are not in a consistent format that is readily uploaded into the new database. Until a solution has been identified and implemented, ground water data will not all reside in a single repository for NMED.

In addition to the department-wide database, NMED is working with the Office of the State Engineer on a well sharing project. This project will allow the State Engineers Office and the NMED to share well data electronically.

Also of note is the growing use of geographic information systems (GIS) in the state for the management of ground water and other related environmental data. ARC/INFO and ARCVIEW software has become the *de facto* standard for GIS development in New Mexico. The Water Resources Division of USGS in Albuquerque has developed extensive GIS map data-layers relating to ground water quality issues. The City of Albuquerque has also accumulated some information in its GIS that is useful for ground water quality analysis. The State Engineer Office has developed GIS capabilities that will be used for ground water administration and data analysis.

Currently, the SWQB uses GIS to document water quality impacts and to provide coverages for use by various bureaus within the department for public meetings, grant-related requirements and general information dissemination.

5.7 COUNTY AND MUNICIPAL AUTHORITIES RELATED TO GROUND WATER QUALITY

The New Mexico State Legislature has given extensive authority to counties and municipalities in the areas of regulation of land use and of protection of public health and safety, areas with substantial implications for ground water quality protection. The principal statutes in these areas are summarized in Appendix E, while the most important aspects for water quality are described below. The statutes grant to local governments broad authority to adopt regulations or take other measures pertaining to protection of health, suppression of disease, sewage facilities, water facilities, refuse collection and disposal, etc. In reviewing these statutes, one should be aware of the provision in § 4-37-1, NMSA 1978 which states: "All counties are granted the same powers that are granted municipalities except for those powers that are inconsistent with statutory or constitutional limitations placed on counties."

Although counties and municipalities have extensive authority to institute measures to protect ground water quality, most have not taken full advantage of this authority. One reason is that most counties and municipalities have limited resources. Another factor that deters some local governments from instituting aggressive ground water protection programs is a division of opinion among citizens about land use regulations that limit what they can do with their property, and whether such programs are desirable.

5.7.1 SUBDIVISION REGULATIONS

The New Mexico Subdivision Act, first adopted in 1973, was extensively amended in 1995. The new amendments change the definition of "subdivision" to include almost all divisions of land. They require counties to adopt regulations regarding items of critical concern such as water availability and quality, utility easements, roads, protection of cultural sites, and liquid and solid waste disposal. Under the new amendments the subdivider must meet the needs of the subdivision with respect to these items; previously, the subdivider only had to satisfy whatever proposals he made in his disclosure statement. The Counties of Bernalillo, Doña Ana and Santa Fe had until July 1, 1996 to adopt regulations meeting the new criteria, whereas all other counties had until July 1, 1997 to do so.

5.7.2 PLANNING AND ZONING

Counties and municipalities have authority for planning and platting and, under the Zoning Enabling Act (§§ 3-21-1 et seq., NMSA 1978), authority to establish zoning restrictions designed, among other things, to promote health and general welfare and to facilitate adequate provision for water and sewerage. Newly discovered ground water contamination problems, resulting from old underground storage tanks, industrial wastes, septic systems, and evapotranspiration system leakage, have aroused the interest of public officials in new planning and land-use approaches based on very real, current needs, and may well provide the impetus for a new generation of realistic land-use regulation.

5.7.3 CONDITIONS APPLIED TO STATE REQUIREMENTS

A condition affecting what the state can require of local governments was added to the Constitution of the State of New Mexico in 1984:

> "*A State rule or regulation mandating any county or city to engage in any new activity, to provide any new service or to increase any current level of activity or to provide any service beyond that required by existing law, shall not have the force of law, unless, or until, the State provides sufficient new funding or a means of new funding to the county or city to pay the cost of performing the mandated activity or service for the period of time during which the activity or service is required to be performed.*"

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